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EDITORIAL NOTES—GAS, &c.

Gas in the Open Market—Successes Illustrated.

THIS is one of the two periods of the year when the attention of all concerned in the gas industry is focussed more than at any other time on its commercial affairs. The financial statements of private enterprise in gas supply are now being presented to those who share in both capital provision and the profits derived from trading; and, from those accounts and the addresses from the chair, there is much satisfaction to be obtained. Wherever one carries investigation, the same strength of position is found; and this is emphasized by contrasting the affairs of to-day with a period removed from the present by (say) a decade or two. Dividends (especially in the case of sliding-scale companies) are generally found to be at a higher level. This is not due to the maintenance of the old prices for gas. Prices to the consumer are, in progressive concerns—whether sliding-scale, maximum priced, or local authority—at lower points; and differential prices for distinct classes of service, according to the competition that gas has to meet in each branch, are now more commonly the vogue. To-day, generally speaking, residuals are of lower market value; while raw materials are not likely to again touch the low prices that have periodically ruled. The half year just closed, it is quite present in mind, was not a good one for gas supply through a conglomeration of circumstances that, fortunately, does not often obtain; but we are writing from the point of inspection that admits of general impression. With lower prices for gas, the reduced market values for residuals, and higher costs for material, what is it that has enabled the financial condition of undertakings to be strengthened, dividends to be maintained and even increased, funds to be accumulated, in fifteen companies employees to be taken into partnership and participating in profits, and the market values of gas stocks to appreciate? The answer is a twofold one: Improved working, and the great expansion of business. But the business now done yields smaller profits per unit of output than heretofore. It is the aggregation of these smaller profits per unit of output that, with the improvement in the produce per ton of material carbonized, accounts for the sound financial position of the present time.

Save that it has monopoly in its own prime product, every gas undertaking is to-day in no better position than any ordinary shopkeeper. Every product in which a gas undertaking deals has competitors in other forms. It may be the competitors are less efficient and (or) more costly; but all of them have some advantage of which the greatest use is made in discounting the superiority in other directions of the gas undertaking's commodities. To meet this competition, the best planned commercial methods are adopted; and the statements presented to those with investment in the gas industry exhibit the effective manner in which these methods, and the irrefragable facts as to cheapness and efficiency of the commodities, are used in the competition. There are published in the "JOURNAL" this week the reports of the meetings of the South Suburban, Tottenham and Edmonton, Croydon, and Bournemouth Companies. In all of these, there are illustrations of the successes of gas in competition; and we refer to them as reflecting the position in the time's competition of gas undertakings that are operating in residential districts with more or less diverse topographical characteristics. The greatest competitor is, of course, electricity; but the meetings of these Companies all show very encouraging points, notwithstanding the advantages (which cannot be ignored) that municipal ownership of electricity supply undertakings confers. In lighting, gas has by its advances maintained its supremacy over electricity in respect of cost and efficiency, both for interior and exterior lighting. Instancing which, in connection with public lighting, is the fair trial for the lighting of the streets of Beckenham, other than the main shopping street, which is already equipped with flame arc lamps. Acknowledgment ought to be made of the fairness of the Beckenham District Council (themselves the owners of the electric supply undertaking) in allowing a competition, in a line in one road, of modern gas lighting by Carpenter inverted burners and electric metallic filament lamps, and for deciding the question on its merits. No comment is required to intensify the importance of the announcement made by the Chairman (Mr. Robert Morton), at the meeting of the South Suburban Company, that the result of the trial is that the Council have decided to light the whole of the district, containing 700 lamps, with the new inverted gas-burners, and have given the Gas Company a contract for seven years. Turning for a moment to the report of the meeting of the Brentford Gas Company published last week, the statement is found in the speech of the Chairman (Mr. Ulick J. Burke) that the Directors were recently making agreements with several of the local authorities in their area for street lighting by gas (in some cases instead of electric lighting) under contracts for five years. If the South Suburban and Brentford Companies can prove advantage to the local authorities of the incandescent system of lighting over electric metallic filament lamps, there is no reason or excuse why other gas administrations should not do the same—if the local authorities will deal with the matter on the basis of a fair field and no favour.

Turning from public lighting to shop lighting. In Croydon, there is a large and important shopping centre known as North-End. In this one centre, observation of the shop fronts seemed to indicate that gas was there losing ground; but Mr. Thomas Rigby (who presided at the meeting of the Gas Company last week in the absence, through a sorrowful circumstance, of Mr. Charles Hussey) announced that investigation had disclosed that in this particular area, in the past three years, the gas business had increased by 5 per cent., and that one of the largest consumers of electricity has found it an economical proceeding to instal a gas-engine and dynamo and generate his own current. Again, presiding at the meeting of the Tottenham and Edmonton Gas Company (through the absence of Mr. Corbet Woodall owing to indisposition), Sir Daniel F. Goddard, M.P., narrated how, in his own town of Ipswich, despite municipal electrical competition, gas is holding its own in all directions, even in those fields—shop front and public lighting—the occupation of which is specially aspired to just now by the electricians. To meet all forms of competition and the fancies of consumers (which have nowadays perforce to be indulged, so as to retain business), gas undertakings should, wherever practicable in main thoroughfares, put themselves in the position to supply high-pressure gas, as is now done in Fleet Street and other thoroughfares in London. In the neighbourhood of Fleet Street, the Gaslight and Coke Company can already report the eviction, through the presence of their high-pressure gas-main, of electric lighting in certain business establishments.

In addition to economy and efficiency for lighting, gas has the advantage among competitors of a range of applicability with which they cannot vie. By the aid of an unproductive lowness of price per unit, electricity strives to contend with gas for heating and with less keenness for cooking. But expense and low efficiency are against the competitor. One of the interesting and salient features of the present meetings is the almost unanimous report that gas-fires (with and without the convenience of a boiling-ring) have of late, as the result of improvement and economical burning, been making a noticeable advance in public favour. It is wise to note these things, and take advantage of any turn in popular regard to make special efforts in the particular direction concerned. There is illustration in the meetings that are under special notice that should serve to invigorate action in the gas-fire branch. At Croydon, the increase in the number of fires fixed was greater last half year than in any previous one; and the South Suburban

Company also had an increase of 700 gas-fires. We have not the gas-fire figures separately for Tottenham; but the addition to the number of cooking and heating stoves compared with a year ago is no less than 6873. At Bournemouth in this department, Mr. Harold Woodall reports an interesting condition of affairs. At one time the temptation of low hiring rates had to be held out to get people to adopt gas-fires; but last half year, no less than 461 fires were sold by the Company—in other words, three fires were sold to every one let on hire. The same thing cannot be reported of cookers. Their adoption goes on apace on all hands—but on hire; few being bought outright. One more figure from Bournemouth. In 54 cases, the Company during the half year fitted gas water-heaters to the hot water-circulating systems of houses. But all such work as this, with the pressure of competitors spurred by the knowledge of the intrinsic disadvantages of their own commodity, needs a well-ordered gas distribution and sales department.

From the gaseous to the solid fuel produced by gas-works. Coke now has its competitors; and the Coalite people also threaten to put in competition their half-carbonized coal. There is no reason why gas-works should not become the central market for the domestic fuel supply—gaseous or solid—of a locality. It was stated at the Croydon meeting that about 25 per cent. of the coke produced was sold locally; but it is thought there that, if the economy and advantages of coke for domestic use were better known among householders, a largely increased proportion of the make would be sold locally. We have heard lately of even the Gaslight and Coke Company—great undertaking as it is—selling coke in small quantities in paper bags, and that it has been done elsewhere. Gas is sold in pennyworths; and a good thing is made out of it. Why not trade in coke in small quantities? Tottenham last October commenced retailing coke in 28-lb. lots in paper bags; and 359 tons have since been disposed of in this way. The purchasing capacity of the poor is only in small hand-to-mouth quantities; and no one appreciates more than the poor conveniences that are put in their way for meeting their requirements. A big business is frequently created from small beginnings—the prepayment gas business can again be quoted as example. Every business in commodities of daily use should (of course, on a profit basis) be run on lines that give facilities to all. The retailing of coke in small quantities will advertise itself; and the business is bound to grow.

On all hands, then, the position, prospects, and capacity of gas undertakings for doing business in their primary and secondary produce for lighting, heating, cooking, and power are excellent; and—is it too much to say?—the envy of all competitors.

In the Present Session.

The opening of Parliament on Tuesday last turns one's thoughts to the legislative affairs that are known to be on the table for consideration during the session. The brilliant ceremonial attending the opening had its transient interest; but this soon gave place to more or less sober consideration of the outline then submitted of sessional plans. Modest as is the outline, it portends much for the already heavily oppressed taxpayer. The liabilities of the nation have been of late increasing at a rapid pace; while revenue and trade have simultaneously been making a fast retrograde movement. There is no escape from these incongruent conditions. The liabilities must, of course, be met, and Parliament has to consider ways and means. It has not therefore caused astonishment, but the taxpayer already trammelled by excessive burdens recognizes that it bodes ill, to read in the speech from the Throne that "the provision necessary for the services of the State in the ensuing year will require very serious consideration, and, in consequence, less time than usual will be available for the consideration of other legislative measures." Reading between the lines, it is clear the country's fiscal position is a grave one, and that industry, commerce, employment, and the individual will all in some degree be involved in whatever plans are adopted to effect the co-ordination of income and outgoings. But, however little may be the surplus to the time absorbed in setting in order the national finances for the discussion of other legislative measures, the Government are intent on the furtherance of their so-called social reform policy. In the King's speech much is again promised to labour; but that much does not satisfy the Labour Party, who have already shown a restive and rebellious spirit, and have threatened the Government with all the pains and penalties that the collective displeasure and vindictiveness of the party can produce and inflict. The Labour members are resolved to hamper the Government and hinder progress as much as possible. Unemployment is the pivot on which their discontent revolves. But seeing that two paragraphs in the King's speech are devoted to the matter, and that the report of the Poor Law Commission deals suggestively with the same question, the attitude of the party is a somewhat irrational one, and one calculated to detach public sympathy from them. The problem of unemployment is too great and momentous to be dealt with by ill-considered drastic methods and devices. It is a matter that admittedly needs the earliest possible treatment, but that treatment to be of durable service and effect must be on a wisely conceived, systematic basis. In this instance, such a basis cannot be brought into existence in any precipitate or casual manner; and the Labour Party, however fervent in the cause and well-intentioned in spirit, will not be serving the best interests of their constituents by the adoption of any harassing tactics. It is complained by the Labour Party that the proposals of the Government do not go to the root causes of unemployment; but they decline to be persuaded that these root causes can be removed by the closing of the ways of Free Trade, and producing an equality in business relations with other nations in the manner propounded by Tariff Reform. That, however, is a controversial political question which need not be raised here.

It will be seen, so far as the power of forecast is granted by the raising of the parliamentary curtain, that the gas industry, other than as tax and rate payers, will not be specially concerned in any of the larger questions that will occupy the session. Nor is there likely to be a very great deal to engage attention in Private Gas Bill work. It is not always possible to even approximately gauge the amount of conflict there will be in the Committee Rooms by the mere knowledge of the extent of the lodging of petitions against measures, unless it be that the number of Bills petitioned against is small, or the names of petitioners indicate that protection and not hostility to principle or main object is the mark of the initial operation. Many petitions are lodged solely as safeguards, or else as levers to gain some advantage—merited, or more often than not the spoil of opportunity. The Gas Bills against which petitions have been presented this session are not of large number; and in certain cases, there are reasonable grounds for saying, satisfaction will be realized before any open contention is witnessed. If, in the event, more than a dozen Gas Bills are seen before Select Committees in the First House, we shall be surprised. There is a long list of petitioners against the Gaslight and Coke Company's Bill; and this is nothing more than was expected. The London County Council and the Corporation of the City are among the petitioners. The West Ham Corporation and two or three of the neighbouring authorities have ranked themselves in opposition. The Ilford Gas Company, too, have knowledge of some cause for making claim to consideration; and the Wandsworth Borough Council are intending to ensure that the price of gas in the Gaslight and Coke Company's southern area shall revert to an equality with the South Metropolitan Company's charge, if Parliament permits equality in the standard illuminating power. By statutory decree, equality existed before the South Metropolitan Gas Company obtained, in 1900, the reduction of their standard illuminating power from 16 to 14 candles; and since then the Gaslight and Coke Company have been allowed to charge in their southern district 2d. per 1000 cubic feet of 16-candle gas in excess of the South Metropolitan price. With 14-candle gas, prices will, there is little question, be again levelled.

The Alliance and Dublin Consumers' Gas Company's Bill has several petitions against it; and it is almost certain to be found in the arena of parliamentary conflict. Both the Aldershot Gas and Water Company and the Yorktown and Blackwater Gas Company are applying for electric lighting powers as well as fresh gas authorization. They are opposing each other; and a very formidable list of antagonistic county councils, local authorities, and other interested parties appears against the two Bills. There is very little likelihood of the interests of all the parties who have petitioned being composed this side of the Select Committee rooms. The Eastbourne Gas Company, too, have, by their measure, aroused various authorities, who are doubtful about the proposals, or else are on the *qui vive* for pickings for their

constituents. The opposition Amman Valley and Ammanford Gas Bills both have petitions entered against them by the District Council and the Llandilofawr Rural District Council. Those extraordinarily reputable concerns whose scene of operations is at No. 99, Cannon Street—the Gas and Water Works Supplies and Construction Company, and the Water-Works, Lighting, and Power Investment Corporation—have lodged a petition against the Ammanford Bill; while the promoters of this measure have put themselves into position in respect of the Amman Valley Bill for prosecuting their campaign for the release of the Amman Valley works from the influence of the Eaton promoting coterie, and for compelling them to disgorge any money (if any) paid to their contracting Company in excess of the fair value of the work done. At the moment, there are petitions standing against two or three of the local authority Gas Purchase Bills; but, with perhaps a single exception, they do not appear to be likely to raise questions of much general importance. Several local authority "omnibus" measures are largely opposed; but in such cases the bare names of the opponents do not always denote the section of the measure that induces hostility. Gas Companies are also found among the opponents of Local Authority Bills. The South Metropolitan Gas Company have ground for seeking protection for their rights in connection with the London County Council Tramways and Improvements Bill; and the Cardiff and Shrewsbury Corporation Bills have petitions entered against them by the local Gas Companies. Perhaps a little judicious treaty would, in these instances, set right the matters over which there is present variance. The allocation of the Bills to the two Houses has been made; but, as indicated above, the Bills over which there will be conflict are few, but important in view of the nature of the matters involved.

Gas Employee Co-Partners.

Several gas companies have adopted the system of co-partnership during the past twelve months; and the latest one to do so—the Gaslight and Coke—has such an army of workers to enrol, that it has been thought a convenient time to begin keeping an exact record of the number of employees (workmen and officers and staffs) in the gas-works of the country who are now under the beneficient system inaugurated, improved, and strenuously advocated by the late Sir George Livesey. From the table published on p. 519, it will be seen that it is now some twenty years since profit-sharing, from which was subsequently evolved the larger system of co-partnership, with all its positive influences and tangible ownership, was introduced at the works of the South Metropolitan Gas Company. Twenty years is a long probation term. But it remains on record that adoption, much to the regret of the distinguished pioneer, was marked by an intermittency that would have disheartened a less persistent advocate than Sir George. The South Suburban Gas Company was the second concern to follow the lead of the neighbouring South Metropolitan Company; and successors were the Newport (Mon.), Commercial, and Chester Companies. The Stafford Corporation Gas and Electricity Department also deserve special mention as being among the earlier distributors of a bonus among their men; and they hold the distinction of being alone among municipal authorities owning trading undertakings who directly encourage their men beyond the bare market value of their labour. The scheme naturally lacks the influences of co-partnership, with stock and share holding; but, of course, the Department are helpless in this matter. Altogether there are fifteen Company co-partnership undertakings; and no less than ten of them have come under the system within the past twelve months. It is an imposing monument to Sir George that in the year of the "crossing "of the bar" so many employees had conferred upon them the benefits of the system. The number of employees of the Gaslight and Coke Company (with officers and members of departmental staffs) eligible for the scheme is 10,000; but this figure may be somewhat modified—one way or the other—when the scheme is fully established. Assuming, however, its correctness, there are now in this country 19,681 gas employees, with officers and staffs, sharing with employers and consumers the rewards of enterprise, labour, and custom. No less than 7696 (including the 103 recipients of bonus at the Stafford Corporation Gas-Works) were co-partners before 1908, 1985 were registered during 1908, and this half year it is believed will witness the registering of about 10,000 names in the Gaslight and Coke Company. Contemplating these figures, they are remarkably gratifying; and the hope is that they will receive early and large extension. The influence of the expansion of the system in the past twelve months will undoubtedly be widespread.

Certain of the new co-partnership Companies have met during the past week; and the reports are unanimous as to the amount of interest the introduction of the system has evoked among the men. Indeed, appreciation and enthusiasm are terms that hardly cover the attitude of the men as a whole. They fully understand all that the system involves for them, and all that is expected of them in return. From all quarters, report says the men are aiming to live up to the status conferred by co-partnership, and to deal with their employers in the spirit that their employers have dealt with them. One good feature is the genuine eagerness of men, youths, and boys to become stockholders, and, in numerous cases, to add to their stock by depositing savings in the hands of the Company to accelerate the accumulation of stock. The new advantage placed freely in their possession and keeping has given them an additional reason for maintaining a good character and not giving offence to the powers that be. It is noticeable, too, that the joint partnership has engendered the best of feeling among the men themselves. They have now a common interest; and further they recognize that the interests of the Company are their own. The greater the custom, the cheaper the gas, the greater the employees' stock holding and dividends. They are making capital; and capital provides work, and a comfortable leisure for old age. We are glad these experiences are coming in from fresh companies, as they are the confirmation of experiences that were by not a few previously attributed to personal influences quite apart from the influences of the system itself. Those who desire the refuting testimony to the mistaken belief can find it in the reports of the meetings of the Croydon, Tottenham, and Bournemouth Gas Companies. But we must say this, that had it not been for personal influence, the system would never have been so firmly established as it is to-day, and completely developed ready for adoption by all Companies. Was it not Mr. Carnegie who wrote to Sir George Livesey some few years ago: "Sure, you are on the right lines"?

Compo. Gas-Piping and Electricity.

Many gas managers are now advising the discontinuance of compo. gas-tubing; and they themselves in this regard practice what they counsel. There is greater necessity than ever in these days to avoid its use, especially in places where electricity is, or is likely to be, used. A paper was recently read, by Mr. L. M. Waterhouse, before the Scottish Section of the Electrical Contractors' Association on the subject of conduit wiring; and in it considerable prominence was given to the fact that electric wires and gas compo. tubing are bad companions under one roof. But electrical contractors should bear in mind that generally compo. gas-tubing has been installed before electricity has found entrance to the premises; and the duty therefore rests upon them to wire buildings in such manner that trouble cannot arise. That they have lamentably failed to do this in the past, is clear from the paper. This, of course, was intended to advocate conduit wiring; and one testimonial in favour of this system has been given by Mr. Castle Russell, the Chief Electrical Engineer of the Phœnix Insurance Company. He says: "As a point in favour of tubing work, I can state that the "Phœnix Company up to the present have not paid a penny "loss from fires caused by wiring installations erected on "the barrel system." But, on the other hand, the Royal Insurance Company make this statement: "In the opinion "of this Company, the best general method of enclosing "and protecting the conductors is by the use of stout metal "conduits. It is important to note, however, that numerous "fires have occurred through leakage of current from such "conduits to soft metal pipes."

If a fault arises in the electrical system, and the wire conduit becomes alive, however efficient the earthing, and there is contact with compo. piping, gas may be liberated, and ignition of the gas will probably follow. It has even been found that, so careless in this matter has electrical equipment been made, conduit pipes are at times so run as to serve as supports for compo. tubing; while it should be a *sine quâ non* of good electrical installation that such conduits should not be carried anywhere near compo. piping, nor, in fact, near any other form of gas-piping. Cases have been

known where electrical contractors have deliberately effected earthing by way of the gas system; and then, if explosions or fires occur as a result, the electricians are ever ready to put a black mark against gas, and to veil the truth of the matter. The gas supply is quite safe in the absence of the electrical system; and it is not fair, under the circumstances, to hold the gas-piping responsible for any disaster that may ensue through ignorant or careless electrical installation and wire faults. The Resident Electrical Engineer of the Glasgow Corporation (Mr. W. W. Lackie), in a paper read in 1904, stated that, in the preceding three years, he had recorded fifteen fires due to the melting of compo. gas-tubing; and eight of them occurred on conduit installations which were not properly earthed. Since then—between 1905 and December last—nine cases of fire have occurred in his district through electricity attacking compo. piping. In six of the cases, the metal work was earthed, and in three it was not. The charge of crude electrical installation and bad earthing is fully proved by the record; but, unfortunately, this sort of thing, in the name of economy, may be expected to continue. It is false economy, the results of which have to be borne by the occupier, who is the unconscious victim of incompetence or culpable carelessness. At the same time, in new gas work, it is preferable that compo. tubing should be eschewed where there is any possibility of danger.

Gas Matters in the North of England.

Among the numerous gas companies whose meetings fall to be noticed this week are three of the larger ones carrying on operations in the North of England; and in each case the trade depression that has swept over the country has naturally left its mark—the only difference being in the extent to which the businesses have suffered. At Liverpool, the falling off in consumption during the last six months of 1908, as against the corresponding period of the previous year, was, however, only small—just under 1½ per cent.—and the greater part of this even is attributed to the mild weather experienced. Interesting comparisons of temperature and gas consumption which were given at the meeting would seem to show that there is some reason for this contention. The decrease at Newcastle-on-Tyne, over the whole of the past year, amounted to a trifle more than 2 per cent.; and here the whole responsibility for the falling off is laid at the door of bad trade and the disputes in the engineering and shipbuilding industries on the North-East Coast. The Walker and Wallsend Gas Company, from the same cause, have experienced a much greater falling off; the decrease in 1908, compared with 1907, amounting in their case to nearly 10 per cent. A good spell of really seasonable weather is never past hoping for, and the slackness of trade also will in due season doubtless give place to a more lively state of things. In other words, whatever falling off in business the gas companies named have been subjected to, may be regarded as of a merely temporary character. It need hardly be pointed out, of course, that the more gas comes to be used for purposes of warmth, the greater must be the effect on undertakings supplying this commodity when the winter proves mild instead of cold; and, in just the same manner, the larger the extent to which gas is applied to industrial purposes, the greater must be the effect of the spells of trade depression to which all countries are liable.

Cost of Private Bill Legislation.

This is one of the few hardy subjects that merits the respect and consideration of all engaged in statutorily controlled undertakings. It rises to the surface of public affairs with a fair amount of frequency. Those among us who are interested in Private Bill promotions watch with some amount of curiosity, mingled with trepidation in not a few cases, the accumulation of the sums that will subsequently make the total that will appear in the revenue account attached to the words "Parliamentary expenses." Lord Cromer is the latest to give utterance to the belief that the system of Private Bill procedure is, on the whole, more practical and more satisfactory to all parties concerned than arbitration or a resort to some special tribunal; and then he takes up the seemingly contradictory position that the system causes great waste of time and expense, and gives illustration of deficiency. If the system causes waste of time and money, there is something radically wrong with it. On reputed good authority, it is said that £600,000 to £700,000 a year is the sum spent on Private Bill Committees. Towards this amount no mean contributors in recent years have been the Electricity Power Bills for London, which put the present suppliers on their mettle, and showed a remarkable existing confusion of public and technical opinion on the whole subject. Lord Cromer was the Chairman of one of the Committees who considered the Bills last session that, after several years of offensive and defensive work in Parliament, laid the great problem of the future of London's electricity supply to, it is hoped, permanent rest. It was these Bills that aroused Lord Cromer's sense as to the wickedness of the waste attaching to Private Bill promoting. He believed that in the past two years £100,000 has been wasted over this question. This is short by a considerable sum of the actual expense since the defunct Administrative Company made the original bid for the bulk and power supply of the Metropolis and surrounding territory. At least half-a-million of money has been spent since then, according to the Chairman of the London Electric Supply Corporation. We are not prepared to say that this money has been altogether wasted. The present electrical occupiers of the Metropolis have now the assurance that their vested interests are immune from further attack; and the expenditure has saved the public from putting millions into one form or another of a scheme that had failure written across its face.

A Question of Principle.

However, Lord Cromer is of opinion that, in connection with Private Bills, Parliament should decide all questions of principle, leaving the Private Bill Committees only the matters of detail to elaborate. There should be no hard-and-fast rule drawn as is suggested. In connection with these Electricity Bulk and Power Bills, for example, there was (to Lord Cromer) the important principle whether municipalities should undertake the work or whether resort should be had to private enterprise. This cannot be regarded as a question of principle that should be inflexibly settled by Parliament. If the present or any other Parliament determined the so-called principle in favour of municipal ownership, it would at once create greater instability in private investment and tend to largely stifle private enterprise to the detriment of the whole country. There ought to be no principle established in this respect; and this is proved by the Gas Bills which have in recent sessions raised the subject of purchase. Whether there should be municipalization or otherwise is wholly a matter of public advantage, with protection of the capital brought into being by the prior conferment of rights by Parliament. Without inquiring in each case, it is impossible to say whether change of administration from private to municipal would be to the public benefit. Certainly in the case of gas, there have been instances in which profligate municipal administration of other services has proved that the transfer from private ownership would not be of advantage; and there has been an instance or two of exposure of such sleepy management on the part of Company Boards that Parliament were able to say without reserve that the public in these localities could not be worse off under municipal ownership. It would be a serious matter indeed if Parliament established any principle like the one suggested.

Use of Tar on Roads.

A welcome reminder of the use to which tar is now being put in connection with the prevention of dust on roads is contained in a report which we publish to-day by Mr. T. H. Yabbicom, M.Inst.C.E., the City Engineer of Bristol, which has been presented to the Sanitary Committee of the Council. This report, it may be remarked, is a valuable and interesting one, furnishing, as it does, figures of cost, &c., compiled as the result of trials extending over some time. The conclusions arrived at by Mr. Yabbicom will be seen to be much in favour of the use of tar. Over 50 miles of roads were treated in one of three ways. With a heavy traction machine supplied by the Taroads Syndicate, the expense of first cleaning, tar spraying, and sanding 41½ miles averaged 0·95d. per yard superficial. The second method was a portable hand-spraying machine, holding 12 gallons of hot tar, which proved very successful on 1½ miles of road having light traffic, though the force with which the tar was delivered was found scarcely sufficient for the necessary penetration of the macadam where there was much wear and tear. The cost in this case worked out at 0·58d. per superficial yard. Tar painting by hand labour was

carried out on 7¾ miles of road; but more tar was used in this process, the results were not so even, and the time occupied was considerable, while the cost averaged 1·41d. per superficial yard. The figures given, it is pointed out, mean the total cost of the tar treatment, by whichever process, over the whole season. Chemicals in solution were also tried; the cost varying from 0·66d. to 0·75d. per superficial yard for the season. On the question of the prevention of dust, however, the reports from all the district surveyors were unanimous in giving a decided preference to the treatment by tar; the dust nuisance having been reduced to a minimum during the whole season by one application. After the tar was applied, an enormous saving was shown in the outlay on road-watering; the carts thus thrown out of use, of course, being available for watering other roads that would not otherwise have had so much attention. On the cost of repairs, too, the district surveyors are decidedly of opinion that a continuation of the tar treatment will have a considerable beneficial effect. The point of the report that we would emphasize, however, is Mr. Yabbicom's statement that "it has been abundantly proved that tar, wherever it has been put, and in whichever manner it has been employed, has effectually attained the object of dust prevention." The chemical treatment, it should be added, also "produced the desired end, though in a less degree."

Income-Tax Allowance for Depreciation.

The question of income-tax allowance for depreciation by wear and tear has been before Mr. Justice Channell on appeal by the London County Council in respect of the tramways south of the Thames. It will be remembered that the question, *mutatis mutandis*, was raised some time since in connection with gas-works. In this instance, the matter has been argued and decided on a case in which a complete change was made from one system to another—that is to say, from horse to electric traction. By arrangement, the practice has been to make an allowance upon the basis of actual expenditure upon renewals rather than an estimate of wear and tear. Upon the conversion of the tramway system to electricity, however, the Inland Revenue Commissioners made no allowance for the renewal of the lines partly worn out and replaced with those suitable for electric traction, nor was anything allowed for the wear and tear of the cars. The ground of the Commissioners' refusal was that the Council had "renewed" with a better and more costly system. Justice Channell sided with the Commissioners; so that income-tax allowance for depreciation has its limitations. It looks as though one may renew a piece of plant with its like; but if entirely new plant is put in which has the same or improved effects, but is different in style and operation, the income-tax allowance for depreciation is altogether denied by the Commissioners. The step from sense to nonsense never was a long one.

Local Authorities and Publicity.

The Royal Assent having recently been given to the Local Authorities (Admission of the Press to Meetings) Act, 1908, a circular has been drawn up by the Local Government Board for the purpose of drawing the attention of the bodies concerned to the provisions of the measure. The Act is one that will be welcomed in many quarters, both by representatives of the Press, who will now know precisely what rights they have, and by members and officials of authorities, who can see exactly what they must not do. As is pointed out in the circular, the effect of the Act is to give to duly accredited representatives of newspapers, or of news agencies which systematically supply reports and information to newspapers, the right of admission to the meetings of every local authority as defined by the Act. This provision, however, is subject to the qualification that an authority may temporarily exclude such representatives from a meeting as often as may be desirable when, in the opinion of the majority of the members present at the meeting (expressed by resolution), the special nature of the business to be dealt with renders such exclusion advisable in the public interest. This is all plain-sailing, and, with a clear definition of what constitutes a "local authority" for the purposes of the Act, would appear to render impossible any misunderstanding or irregularity. The definition is as follows: A council of a county, county borough, borough (including a Metropolitan borough), urban district, rural district, or parish, and a joint committee or joint board of any two or more such councils to which any of the powers or duties of the appointing councils may have been transferred or delegated under the provisions of any Act or Provisional Order. A parish meeting under the provisions of the Local Government Act, 1894. An education committee and a joint education committee under the 1902 Act, so far as respects any proceedings not required to be submitted to the council for approval. A board of guardians and a joint committee under the 1879 Poor Law Act; and the board of management of any school or asylum district formed under any of the Acts relating to the relief of the poor. A central body and a distress committee under the Unemployed Workmen Act, 1905. The Metropolitan Water Board and a joint water board constituted under the provisions of any Act or Provisional Order. Any other local body with power to make a rate, the proceeds of which are applicable to public local purposes, and leviable on the basis of an assessment in respect of property. The expression "rate" as used here also includes any sum which, though obtained in the first instance by a precept, certificate, or other document requiring payment from some authority or officer, can be ultimately raised out of a rate. The circular further points out that the Act does not extend to any meeting of a committee of a local authority, as defined for the purposes of the Act, unless the committee is in itself such authority; but it is not to be construed so as to prohibit a committee of a local authority from admitting representatives of the Press to its meetings or a local authority from admitting the public. It seems here that every eventuality has been provided for; but, of course, that is frequently the case with Acts of Parliament—until a dispute arises.

The Scottish Junior Gas Association (Western District) will on Saturday pay a visit to the Paisley Gas-Works, at the invitation of Mr. G. R. Hislop, the Engineer and Manager.

Southern District Association.—The annual general meeting of the Association has been fixed for Thursday, the 18th prox., at the Hotel Cecil, when Mr. James Paterson, of Redhill, will deliver his Presidential Address. The members hold their annual dinner the same evening.

Institution of Mechanical Engineers.—In the report presented at the annual meeting of the Institution of Mechanical Engineers last Friday, it was stated that there had been a net gain of 220 in the membership, raising the total to 5458. The total revenue for the year was £14,566, while the expenditure was £11,008. Reference was also made to the various researches in progress under the auspices of the Institution; including investigations of problems in connection with gas-engines, steam-jackets, and friction of gears. The awards presented included the "Water Arbitration Prize" to Mr. John Don, for his paper on "Filtration and Purification of Water for Public Supply," an abstract of which was given in the "JOURNAL" for the 9th inst. (p. 383). The new President is Mr. J. A. F. Aspinall, the General Manager of the Lancashire and Yorkshire Railway.

Parliament and Trading Organizations.—The Employers' Parliamentary Council have passed a resolution in support of the following motion, which, in accordance with notice given last year, the Earl of Wemyss will bring forward in the House of Lords in the present session: "(1) That in the opinion of this House it would be for the public good that important national trading and other organizations and societies would each name three Peers in the current and each succeeding Parliament to speak and act on behalf of such societies in all questions in which they are interested; and that the names of the Peers so nominated be entered in the journals of the House. (2) That the Lord Chancellor, the Marquis of Lansdowne, the Earl of Crewe, and the Earl of Halsbury be empowered to determine what societies are of sufficient importance to be admitted to the privilege of nomination. (3) That no Peer shall be entitled to vote on any public question who has not attended twenty sittings in the current or previous session of the House."

Manchester District Institution of Gas Engineers.—As already stated in the "JOURNAL," the 39th annual meeting of the Institution will be held next Saturday at the Grand Hotel, Aytoun Street, Manchester. The business meeting will include the Inaugural Address of the President-Elect (Mr. J. W. Morrison, of Sheffield), a paper by Mr. Robert Watson, of Doncaster, entitled "Make and Sale of Coke," and a description by Mr. J. G. Newbigging of the gasholder tank in course of construction at the Bradford Road Gas-Works of the Manchester Corporation. The proposed alteration of the rules and the question of a contribution to the Livesey Memorial Fund also figure on the *agenda*. In the morning, there will be two visits which should prove of great interest to the members. The Committee have accepted an invitation to inspect a Feld washer at the works at Newton Heath of Messrs. R. & J. Dempster; and by permission of the Manchester Gas Committee, an inspection will also be made of the Bradford Road gasholder tank of which Mr. Newbigging is to submit a description. The meeting will be followed by high-tea.

THE MESSINA FUND.

BEFORE he had an opportunity of seeing the notice in last week's "JOURNAL" that the Messina Fund had been closed, Mr. Robert Dempster (Messrs. R. & J. Dempster, Limited, of Manchester) forwarded £10 towards the relief of the gas-workers who have suffered by the earthquake at Messina. This amount has been sent to the fund that Mr. Martin has been getting together.

OBITUARY.

We are sorry to hear of the death, in her 86th year, of Mrs. HERSEY, the widow of the late Mr. Thomas Hersey, who was in olden times with the Imperial Gas Company, and, after the amalgamation, with the Gaslight and Coke Company. Mrs. Hersey had a stroke, and after lingering for about three weeks passed away on the 8th inst., at Sutton, Surrey. The sympathy that will be felt for Mr. Sidney Hersey (of Messrs. Kirkham, Hulett, and Chandler) in the loss of his mother will be intensified by the fact that his sister, Mrs. METHVEN, the widow of the late Mr. John Methven, died at Perth, Western Australia, on Dec. 21, in her 61st year. She was at the time on a visit to a son.

PERSONAL.

DEPUTY-GOVERNORSHIP OF THE GASLIGHT AND COKE COMPANY.

The tenure of the Governorship and Deputy-Governorship of the Gaslight and Coke Company is nominally a yearly one; and annually, at the Board meeting succeeding the February meeting of the proprietors, the occupants of the offices are formally re-established by their colleagues in position. At the last Board meeting (we learn from the Secretary, Mr. Henry Rayner), the Deputy-Governor over so long a period—Mr. HOWARD CHARLES WARD—did not seek re-election to the office; and the Directors therefore appointed Mr. ULICK J. BURKE as his successor. Mr. Ward has attained a great age; and his association with the direction of the affairs of the Company covers many years. His interests in the gas industry apart from the Gaslight and Coke Company are considerable. It will be remembered that until just lately he was the Chairman of the Brentford Gas Company, being succeeded in the chairmanship (but still retaining a seat on the Board) by Mr. Burke; and he is also a Director of the Portsea Island Gas Company. The stepping down from the position of Deputy-Governor of the Gaslight and Coke Company to the rank of ordinary Director is but the result of a natural desire, at Mr. Ward's age, for a release from some of the responsibility that he has well shouldered during the years of greater physical power and energy. It may be recollected that he was re-elected a Director of the Company at the last meeting; and the Governor (Mr. Corbet Woodall) then testified to the fact that Mr. Ward had never slackened in his interest in the prosperity of the undertaking.

DECORATION FOR MR. ROBERT S. GARDINER.

It is with much pleasure, which will, we are sure, be shared by many of our readers, that we learn, from the current number of the "Journal des Usines à Gaz," that Mr. Robert S. Gardiner has been nominated by the President of the French Republic, on the proposition of the Minister of Foreign Affairs, a Chevalier of the Legion of Honour. Mr. Gardiner, it may be remembered, has for many years been identified with the gas industry on the Continent. He was for some time Secretary of the Imperial Continental Gas Association, and is now a Director of the Continental Union Gas Company, Limited, the Union des Gaz, and the Danish Gas Company. He is also a Director of the British Gaslight Company, Limited, of the Pelton Steamship Company, Limited, and of Messrs. John Bowes and Partners, Limited. He has for nearly thirty years been a member of the Société Technique du Gaz en France; and at the meeting of the Society in Paris last June he was re-elected for three years a member of the Committee—securing only two votes less than the highest number polled. Referring to the distinction conferred upon Mr. Gardiner, the Editor of our contemporary remarks that his colleagues have so frequently had opportunities of appreciating the cordiality of his relations with, and his devotion to, the Société Technique, that he (the writer) is pleased to be the medium of conveying to him their hearty congratulations. Our readers will doubtless recollect that on the occasion of the visit of a party of the members to the Franco-British Exhibition at the close of their meeting last year, Mr. Gardiner took a conspicuous part in making their visit agreeable; and at the luncheon to which they were invited at the Garden Club, under the presidency of Mr. H. E. Jones, he responded in French, at the request of the Chairman, to the toast of "The Ladies," which had been cordially proposed by M. Visinet.

At a recent meeting of the Directors of the Tawe Valley Gas Company, Mr. REGINALD D. SILCOX was appointed Secretary and Engineer to the Company; and he will enter upon his duties in April. Mr. Silcox is at present Manager of the Pontycymmer Gas Company.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
Feb. 15	Amount already acknowledged	3931	1	0
,, 16	Alliance and Dublin Consumers' Gas Company	100	0	0
	Thomas Bower, West Hartlepool	5	5	0
	Brierley Hill District Gas Company	5	5	0
	W. B. Crowfoot, Beccles	1	1	0
	Harlow and Sawbridgeworth Gas Company	1	1	0
	Manchester Corporation Gas Committee	105	0	0
	Rochester, Chatham, and Gillingham Gas Company	10	10	0
,, 17	Samuel Glover, St. Helens	5	0	0
	Torbay Paint Company, London	10	10	0
	William A. Valon, London	10	10	0
,, 18	Castleford and Whitwood Gas Company	3	3	0
	Frederic W. Cross, Lea Bridge	1	1	0
	John Wilton, Bow Gas-Works	2	2	0
,, 19	Ascot District Gas and Electricity Company	5	5	0
	James W. Auchterlonie, Cambridge	5	5	0
	Bombay Gas Company	25	0	0
	Cambridge University and Town Gaslight Company	52	10	0
	William Duff, Morecambe	1	1	0
	Gaslight and Coke Company	1000	0	0
	Walter Hunter, Westminster	5	5	0
,, 20	Chigwell, Loughton, and Woodford Gas Company	10	10	0
	F. Smallbone, Woodford Green	2	2	0
	Aldershot Gas and Water Company	5	5	0
	John Barker, Leven, Fife	1	1	0
	C. F. Broadhead, Middleton, Lancs.	1	1	0
	Grantham Gas Company	10	10	0
	J. van Rossum du Chattel, Amsterdam	1	1	0
	Salford Corporation Gas Committee	52	10	0
	William W. Woodward, Salford	2	2	0
,, 22	John Bond, Southport	5	5	0
	Joseph Braddock, Oldham	5	5	0
	Joseph Cash, Brighton	2	2	0
	Croydon Gas Company	200	0	0
	Archibald Dougall, Kidderminster	1	1	0
	F. W. Goodenough, Gaslight and Coke Company	2	2	0
	F. J. North, Stourbridge	5	0	0
	High Wycombe Gaslight and Coke Company	2	2	0
	William Mann, Brentford Gas Company	3	3	0
	Total	£5597	17	0

Professor Forrest R. Jones on the Gas-Engine.—We have received from Messrs. Chapman and Hall, Limited, a new American work on the gas-engine, by Professor Forrest R. Jones (published by John Wiley and Sons, of New York). The author explains in his preface that his work is presented in the manner believed to be most suitable for a text-book for class instruction and for directing laboratory experiments, as well as for meeting the needs of those who wish to learn to operate commercially and to test. The illustrations, with one or two exceptions, are representative of American practice; but the text is based on information gained by personal observation of motors in England, France, Germany, and Belgium, as well as operating experience in America. We hope to notice the book at greater length in an early issue. The price is 17s. net.

Mr. Henry O'Connor on "Petrol Air-Gas."—We have received from the publishers, Messrs. Crosby Lockwood and Son, a small practical handbook (bearing the title of "Petrol Air-Gas"), by Mr. Henry O'Connor, on the installation and working of air-gas lighting systems for country houses. The author's name is well known to most of our readers, being a Past-President of the Society of Engineers; and, as mentioned elsewhere, he is now delivering a course of Keith Lectures on "Gas Manufacture and Lighting" at the Royal Scottish Society of Arts, of which he is a Fellow. His book is divided into seven chapters, in which are described previous plants and systems for lighting country houses, a history and description of petrol gas are given, with comparative costs, and the features of various plants and burners are indicated. The text is illustrated, and is followed by some useful memoranda in regard to metric equivalents and other matters, and an index. As the book is intended for the lay reader, the author has referred as little as possible to technicalities. The price of the book is 1s. 6d. net.

ELECTRICITY CONSUMERS PREFER HIGH-PRESSURE GAS LIGHTING.

THE high-pressure gas-main that has been run through Fleet Street primarily to supply the new 1500-candle power street lamps is opening out new business for the Gaslight and Coke Company in a manner that is giving to anticipation a greater head in realization than the active and persevering staff of the Company's trading department could possibly have entertained as the reward of their work in the short period since the main was laid. High-pressure gas-lamps of 100-candle power are not only displacing electricity for interior lighting, but they are being preferred on entering into the occupation of new premises by firms who have had experience of electric lighting in other buildings.

Two or three instances of the work done in this direction will, we think, be found not only of interest but useful to our readers. From the main running through Fleet Street, a 6-inch main has been carried down Bouverie Street, which is lined on either side by printing and newspaper offices. From this main, a 3-inch branch has been run into the premises occupied by Messrs. Bradbury, Agnew, and Co.—"Punch" office—and a supply of high-pressure gas given through a 200-light high-pressure meter. We may pause a moment here to say, on the question of the metering of the gas under high pressure, that the meter works correctly at 5-10ths pressure; but what has been arranged is that the firm shall pay for the gas registered, *plus* 13 per cent. for the loss of volume due to compression. The meter case, it may also be observed, is strengthened; but the diaphragms are not affected, as the pressures on both sides are equal. As to the lighting, the front building at "Punch" office was formerly illuminated by electricity; but this has been displaced throughout from the General Manager's room. Even on the staircase, the electrical fitting has been converted for high-pressure inverted gas lighting. How the change came about was this: Gas was being supplied to the firm's back premises; and it was proved to them by the Gas Company that there would be a distinct saving if gas was supplied throughout the building. The result is that both back and front buildings are now supplied with high-pressure gas. Through supplanting electricity, the front building had to be piped throughout; and in order to save the necessity for having more than one meter, a 3-inch outlet from the meter was run underground and through the front building, connecting up with the pipes in the back building. Altogether 150 electric lights were displaced; and in all 350 of Keith's 100-candle power high-pressure gas-lamps have been installed in the two buildings, in the stead of electric lights and the low-pressure gas-lights. In the back premises, low pressure gas was formerly used for the drying-presses, glue-pots, &c.; but they have all been adapted for high-pressure gas by merely introducing new nipples and air-regulating shields. The transformation of the lighting arrangements of the building was remarkably sharp work. The installation in the back premises had all to be done in a single night; and eleven men, with foreman, and district inspector did it—and with credit for character of the work. They could not commence operations till seven o'clock one evening as the old lights were required till then. Nevertheless they got 210 lamps up before morning. The old piping in this part was used with the exception of one room which had to be newly piped. A notable point is that, in the machine-rooms, the lamps have actually been hung between the frames and cylinders of the machines, as well as suspended from the folding-boards. This is extremely interesting, as the mantles are standing the shock and vibration of the running machines, where the filaments of electric incandescents found the strain fatal to their sensitive dispositions. The glasses of the lamps in these positions have each a protecting wire cage underneath, in order to prevent the falling of glass in the event of an accident.

Another installation of high-pressure gas lighting has also been made in the premises of Messrs. Gee and Watson, of 111, Shoe Lane, to which premises they have removed from 20-22, St. Bride Street. The firm are process block makers; and at the old establishment electric light was employed. They have sixty of Keith's 100-candle power high pressure lamps fitted; and they are also using gas for their drying-plates and gas-rings.

A third customer for high-pressure gas is the Solicitors' Law Stationery Society, of No. 104, Fetter Lane, to which premises the Society have removed from Norwich Street, where they were using the electric light. A small independent compressor driven by a gas-engine is being utilized in this instance; and 215 of the 100-candle power high-pressure lamps have been installed. The building has not been occupied for some time; but electricity was previously used in it for lighting.

It is found that the new 100-candle power lamps burn a little under 2 cubic feet of gas an hour, after being properly adjusted; and as to mantle consumption, at the Solicitors' Law Stationery Office some of the mantles have been in use fully three months.

Several newspaper and printing concerns in Fleet Street and the neighbourhood are now considering the use of high-pressure gas for melting metal and other purposes.

The "Ironmonger" announces the death a short time ago of Mr. James Richard Kenrick, a plumber and gas and water fitter, of Widnes. Deceased was 57 years of age, and prior to going into business was Manager of the gas and water works in the town.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 563.)

THINGS on the Stock Exchange last week presented a disagreeable falling off in appearance from the bright and buoyant aspect of the week before. For this, recrudesence of apprehension regarding affairs in Eastern Europe was chiefly to blame, though in some minds misgivings touching our home politics had a share. Anyhow, the result was general dulness and inactivity, and a shrinkage in prices. The opening day gave indications of a revulsion; business becoming quieter and markets more delicate. Consols gave way $\frac{1}{8}$; and other Home securities were weaker. On Tuesday, the tendency was just the same. Consols and most of the rest were lower; but the Foreign Market did not participate. Wednesday was another inactive day, being quite unable to shake off the oppressive dulness; and prices continued to give way. Things went from bad to worse on Thursday—espying trouble on the political horizon. Consols had a fall of $\frac{5}{16}$, and the principal departments followed on the downward course. On Friday, much alarm was engendered by intelligence regarding Austria and Servia, and there was a general move to realize. Consols were done as low as 83⅜, and everything was lower in sympathy. Saturday, however, was somewhat less agitated; and in some lines there was a slight recovery from the level of the day before. In the Money Market, there was a very fair demand, and rates for short loans and for discount were firm. Business in the Gas Market was brisk and active. A large proportion of it was in the issues of the leading Company; but a noticeable feature was the continued activity of the South American undertakings and their increase in value. Several other issues advanced in quotation; none receded. In Gaslight and Coke, the ordinary was very active and firm; the closing prices being the best of the week. The range was from 100¾ to 102. In the secured issues, the maximum changed hands at 87½ free, the preference at from 104½ to 105½, and the debenture at from 84⅝ to 85½. South Metropolitan was very quiet, and what business was done was marked at from 120¼ to 121. The debenture made 84¾. In Commercials, nothing was done except two or three deals in the 4 per cent. at 108½ to 109½—a rise of 1. In the Suburban and Provincial group, Alliance and Dublin old realized 18⅝, ditto new 13⅜, British from 42 to 42¾, Bromley "A" 115½ free, Lea Bridge 121½ and 122, South Suburban 122½ (a rise of 1), ditto debenture 125 (a rise of 2), and West Ham 116 to 116¾. In the Continental companies, there were a few dealings in Imperial at from 179¼ to 180⅛, ditto debenture fetched 94 and 95, Union 102 and 101½ free, European fully-paid 23⅞ and 24, and ditto part-paid 17⅝ and 17¾ (a rise of ¼). Among the undertakings of the remoter world, Buenos Ayres was active at from 12⅝ to 13⅛, Cape Town debenture changed hands at 77 and 77½, Monte Video at 11 11/16, Oriental at 141 and 141½, Primitiva at from 6¼ to 6⅜, ditto debenture at 96½ and 96¾, San Paulo at 11¾ and 11 11/16, River Plate at 14 and 14⅛, ditto debenture at 95¾, and South African at 13½.

ELECTRICITY SUPPLY MEMORANDA.

Electrical Curvature—An Admitted Advance in High-Pressure Gas Lighting—Between Maximum and Minimum Candle-Feet—How to Save Money on Public Lighting—Misinterpreting Action.

THE thought had been entertained that the humorous mass of discrepant electrical illumination curves that were published towards the end of 1907 and the beginning of 1908, and again in June last from Mr. A. A. Voysey, the Electrical Engineer of the City Corporation, had completely done its self-destroying work. The curves, the result of much admirable, though ill-rewarded, sacrifice of personal comfort for the sake of nocturnal observation—a sacrifice that we have not yet felt it necessary to make in defence of gas—have declined with dogged determination to confirm the work of one observer by that of another. They have, as has been shown in former criticisms, also yielded such confusion of deduction on the part of electricians that those who looked on this pitiful exhibition in the City of eagerness to insure that electricity, by hook or by crook (or rather we should say by curve), came out cheaper per candle power per lamp per annum, or per average candle-foot, or per some other microscopical unit, asked What next? The "next" has come. It was an error to suppose that the last resource of the electricians to prove—if proof can be given by such uncertain means, and by electricity at 1d. per unit—the cheapness of flame arc lamps would be lightly abandoned. The "Electrical Review" has now published an article the material and curves embodied in which purport to be of editorial origin, but—well, never mind, we will not here make the suggestion that was on the tip of the pen. This time it is the lighting by the new inverted gas-lamps in Fleet Street that is the subject of critical electrical examination in comparison with the flame arcs in Cannon Street; and, of course, in accordance with electrical precedent, gas comes out of the examination second best. But we have something to be thankful for. There is an admission that these lamps have enabled gas to creep up somewhere near to the majesty of the flame arc lamp; so that there is a chance, with such confessed success in hand, that the electricians may shortly agree that gas has outstripped the flame arc. If to the article in our contemporary we add a little to the nice

things said about gas and deduct a little from the nicer things said about electricity (the addition and the deduction being necessary on account of bias), perhaps we may take credit for the new lamps being on a level with the flame arc lamps, if not in advance of them from several points of view.

The "Electrical Review" asserts belief that the claim is fallacious that high-pressure gas with inverted mantles is in any way cheaper or better than electric flame arc lamps for the lighting of public streets. As a cure for this condition of mind, we may recommend a study of Professor Drehschmidt's researches in this connection, upon the results of which researches comment was passed in our issues for Feb. 2 and 9 (pp. 293, 360); the paying of some consideration to the recent statement of Mr. J. R. P. Lunn, the Electrical Engineer of Darlington, that he has not found a flame arc lamp that will give a steady light, and that can be relied upon to keep in working order; together with a refreshing of the mind with the contents of an article on some defects of flame-arc lamps that appeared in the "Electrical Review" as recently as Jan. 15, p. 104. It is not a little surprising to find our contemporary endorsing the view of Mr. Voysey that "light for light high-pressure gas costs four times as much as the electric flame lamp." It may be asked of our journalistic friends to point out any one of Mr. Voysey's curves that gives graphical—never mind whether true or not—substantiation to the declaration. But there is comfort in knowing that our friends are not altogether beyond the pale of redemption; for we read that the "four times" fallacy "is now reduced, as undoubtedly the tests show that the inverted burner is a great advance upon the old type, but still, as regards both cost and effective illumination, there is much in favour of the electric flame arc as compared with the inverted high-pressure mantle." The tests fathered by our contemporary, and on which this opinion is based, are highly edifying. Take Cannon Street first, it is seen that the maximum illumination along the centre of the road is 1·55 candle-feet, while the minimum is 0·1 candle-foot (the last figure being the minimum prescribed by Mr. Voysey). But later on it is observed that "nowhere on the kerb in Cannon Street can we find a lower illumination than 0·18." Therefore the kerb lighting in Cannon Street, according to the "Electrical Review" is better than the centre line lighting! Mr. Voysey, on the other hand, found lower illumination along the Cannon Street kerb line than 0·18 candle-foot—viz., 0·1; and he also succeeded in one observation in getting the minimum of 0·28 candle-foot along the middle of the roadway, but in another observation the minimum dropped to 0·1. And by lowering the height of the lamps from 28 to 26 feet, aided by a distinct inclination to fogginess on the part of the atmosphere, Mr. Voysey got 0·23 minimum illumination along the centre of the roadway. The lamps from these figures appear to be very ill-mannered and inconsistent. There is "a point in the centre of Fleet Street" (those who seek may find) where our contemporary states the illumination drops below 0·1 candle-foot. Now this is really too bad, seeing that before Mr. Voysey made his tests Mr. Haydn Harrison had found, with the old high-pressure vertical burner lamps in Queen Victoria Street, a minimum direct illuminating power of 0·1 candle-foot. We had hoped the electricians would have conceded that gas with the new lamps had done much better in Fleet Street. However, this all exhibits how much reliance can be placed upon these nocturnal illuminating tests.

Our contemporary in its benevolence says that the new high-pressure lamps in Fleet Street do give 1200-candle power outside the area of the reflectors, and (what is more) on the average. We only claim for them 1500 candles on a consumption of 25 cubic feet of gas an hour. But then benevolence once more changes to mercilessness; and again the gas advocates are malignantly driven up into what was formerly one of the tight corners of the electricians. "The only case," we read, "where gas does compete as regards the minimum illumination with the electric light is in the instance where the lamps are erected on brackets 15 feet from the ground, in which case, for all intents and purposes, the minimum is the same; but comparing the maxima, we find 14 candle-feet with the gas against 1·6 with the electric light. It may be said this is a minor point. But is it? The ideal system of lighting is daylight, where the maximum is equal to the minimum; and although this cannot be obtained in practice, the nearer one gets to it, the better must be the effect." First of all, it would therefore appear that these new lamps fixed on brackets are as good as the centrally wire-suspended flame arc ones in Cannon Street for minimum candle-feet. Mr. Voysey told us that his curves showed the advantage of central suspension; but the "Electrical Review" shows the advantage of 15 feet high bracket lighting in attaining the minimum of 0·1 candle-foot while doing away with the overhead wires. Our contemporary does not seem to have taken very much notice of the new gas-lamps on the refuge columns, and which throw a good light up Fetter Lane, Chancery Lane, and over Ludgate Circus, together with the footpath one that lights up Bell Yard. But as to the maximum candle-feet of the new lamps, it appears from another part of the article that the 14 candle-feet is only an estimate. This is bad treatment. The illuminating power of the new gas-lamps defied the capacity of the instrument used for the illumination tests. "The figure," it is stated, "is calculated, as the highest value the instrument would measure was only 5 candle-feet; and this was obtained at a distance of 13 feet from the lamps!" Our contemporary, as shown in the reference to the ideal system, points out that it is altogether wrong to have such a wide difference between maximum and minimum. That is what we have been saying about the flame arc lamps for a long time past; and now any impartial observer (without the use of an instrument incapable of making a proper measurement of the maximum candle-feet of the gas-lamps) will say our contemporary's remark is a case of the pot calling the kettle black. The eye is a very capable observer of light and shade; and we defy anyone to truthfully say that the contrasts to the eye are not more severe in Cannon Street than in Fleet Street. People will have high-power centres of light, whether or not the higher the power the farther one gets away from the ideal system of lighting, and whether or not educated judgment says they are wrong. But our contemporary is now stealing our ancient argument as to what constitutes good street lighting. But is it not strange that the "ideal system" should have met with ridicule and not acceptance at the hands of electricians until the new high-pressure inverted gas-lamps put in an appearance? Of course, electricians will now, and as quickly as possible, pull down their flame arcs as being entirely contrary to the "ideal system." It is a pity our friends did not attempt to take a few curves of the Cannon Street flame arcs and the Fleet Street lamps during the time the streets were recently fog-clad. There is no knowing what minimum candle-feet might have been obtained with the former, seeing that Mr. Voysey's minima were higher when a distinct fogginess obtained in Cannon Street.

London is placed under a further obligation to our contemporary. It shows how the ratepayers may save £63 10s. in the lighting of Fleet Street. We can show how the ratepayers can save still more in the lighting of the street—and by the adoption of flame arc lamps, too. It is so simple. It is only necessary to reduce the number of lamps, and there you are. The price of the 1500-candle power lamps in Fleet Street per annum is only £16 each. The cost of flame arc lamps in Cannon Street, with electricity at the cut-price of 1d. per unit—nothing being allowed for the cost of installation or incidentals—is £17 10s. If only eleven of these lamps were strung up in Fleet Street by overhead wires, the cost would work out to £192 10s., against £256 for the sixteen gas-lamps. The illuminating power of the flame arc lamps in Cannon Street, we should say, is about 1200 candles (we will not discuss nominal and effective candle powers on this occasion); so that eleven lamps would give us about 13,200 candles in Fleet Street, against 24,000 candles by the sixteen gas-lamps now installed. Of course, some electricians will say the flame arcs in Cannon Street are 1500, 2000, or 2500 candles, and, in all probability, there will be others who, with the elasticity of conscience that is peculiar to electricians, will go a bit higher. But electrical curves or no curves, people still think there is something in the good old rule of "seeing is believing." Beyond the greater illuminating power of the sixteen gas-lamps, the light sources being closer together than the eleven flame arcs could be, the illumination of the street—after the glare of excessive shop and newspaper office lighting is cut off—must be more uniform than it would be by using only eleven flame arcs, the diffusive power of which is notoriously bad. It must also be remembered that the Gaslight and Coke Company are lighting this street as a business transaction; while an article published by us on Jan. 14 last year showed that there was not profit in an 11-ampere flame arc, running 4000 hours a year, at £17 10s. But as the "Electrical Times" once said in referring to this lighting: "The costs at the producing end do not always guide in fixing the prices for street lighting, in view of its advertising value." If the City Corporation desire to save £4000 a year, they can easily do it by abandoning the old 400 electrical antiquities in the City for which they are paying £26 a year, and substituting the new inverted gas-lamp at £16 apiece. What a marked difference there would be in the lighting of the City, and what a marked difference in the City lighting account that has to be footed by the ratepayers. Has our electrical friend noticed that the Fleet Street lighting has not only caused the old electric lamps in Ludgate Circus to be changed to flame arcs, but those on Ludgate Hill? Why should the new lamps so upset the old Electric Supply Company, seeing that electrically derived curves show them to be so deficient as illuminating agents? A most interesting effect!

Our last-mentioned contemporary, the "Electrical Times," about November, 1907, stated that "the introduction of flame arcs, and the carbons necessary to produce them, has rendered it possible to light large spaces at a cost which leaves our gas competitors in despair. Their only refuge—a temporary one—is a medium unit of 300 or 400 candle power produced with high-pressure gas." Of course, this was on a par with many other curiosities that appear in the columns of the paper referred to. The high-pressure inverted gas-lamp of high illuminating power, from a single mantle and low gas consumption, was then on the horizon. There was no despair apparent in the gas industry at the time; there has not been any occasion for despondency since; and certainly there is not now. Adoption of flame arcs has not progressed with those leaps and bounds that some electricians hoped for. Our volatile contemporary now indulges in similar talk in connection with metallic filament lamps—speaking of gas being to-day in the last trench, and of gas companies standing at bay; and all because gas undertakings do not show any relaxation of commercial energy. When gas undertakings are in the last trench, or at bay, or have become disheartened, then there may be visible a lessening of activity; but success induces the buoyant activity that is witnessed in the gas industry all around. Our contemporary has put a wrong interpretation upon action, and that is not one of its uncommon failings.

GAS EMPLOYEE CO-PARTNERS.

The following table (which is referred to in our editorial columns) shows the number of gas employee co-partners, with officers and members of staffs, at the present time in this country. The figure for the Gaslight and Coke Company is only an estimate, and may be subject to some modification when the scheme is brought fully into operation.

Number of Gas Employees under Co-Partnership.

	Year Introduced.	No. of Employees Participating.
LONDON GAS COMPANIES—		
Gaslight and Coke	1909	10,000
South Metropolitan	1889	5,558
Commercial	1901	1,201
SUBURBAN GAS COMPANIES—		
Croydon	1908	460
South Suburban	1894	606
Tottenham	1908	605
PROVINCIAL GAS COMPANIES—		
Bournemouth	1908	375
Chester	1901	66
Gloucester	1908	115
Leamington	1908	120
Newport (Mon.)	1900	162
Rugby	1908	37
Tunbridge Wells	1908	125
Walker and Wallsend	1908	87
Wrexham	1908	61
CORPORATION—		
Stafford		103
[Electricity Department, 12]		
		19 681

Upon the figures generally, it may be remarked that in most instances they include officers and members of the staffs. In the case of Gloucester, however, officers in receipt of an income of more than £200 are excluded from the scheme. With respect to the more recent adoptions, in the greater number the whole of the employees have already signed; but there are one or two instances where the enrolling of the men has not yet been quite completed. It is expected, however, that the present year will see every man a co-partner. It is interesting to notice how very close are the numbers of co-partners in the South Suburban and Tottenham Companies. The latter is one of the new adherents to the system; and the enthusiasm of the men over it is notable. For that Company, the following figures as to the position on Dec. 31 last may be interesting:—

Number of co-partners—officers, staffs, and men	605
" " " " " " " holders of £5 and upwards of stock in the Company	400
Total stock transferred to 400 co-partners	£2925
Cash to credit of co-partners after purchase and transfer of £2925 stock	£2600

Regarding the Wrexham Gas Company, the scheme was made retrospective for last year. The bonus allowed was 6 per cent.—amounting to £256.

It is intended to, from time to time, revise the table, and, with the assistance of our friends, to extend the information given. But until there has been a period of working of the schemes under the 1908 adoptions, other figures than those now given would be incomplete and misleading.

Wrought iron cement-lined pipe has been investigated by Mr. Leonard Metcalf, of Boston, who recently read a paper on the subject before the New England Water-Works Association. He stated that experience in America with such pipe for distribution purposes has been generally adverse, and has led to its replacement by cast-iron pipe, excepting where the pressure does not materially exceed 65 lbs. per square inch, and where there has been little disturbance of adjacent ground, likely to cause settlement or other injury. Experience with such pipe for supply mains has been much more satisfactory, and many old mains of this kind are still giving good service, particularly under such conditions as are usual in the case of these supply mains—light pressure, secure foundations, and private rights of way.

The sixteenth annual general meeting of the Association of Technical Institutions was recently held at the Grocers' Hall, Princes Street, E.C., when the President for the year (Dr. G. T. Beilby, F.R.S.) delivered his Inaugural Address. In the course of it, he remarked that if the members held the belief that the industrial future of the nation must largely depend on the spread of education in science, and in the application of its laws to the affairs of daily life, they could not escape from the conclusion that it was their particular duty to see to it that they were taking a leading part in this vitally important work. It behoved them to walk hand in hand with those Universities which had established within their own boundaries faculties of applied science, and to avail themselves of their experience, not only in this special department, but also in other fields of professional training.

WATER LEGISLATION FOR 1909.

[SECOND ARTICLE.]

In the last number of the "JOURNAL," the Bills promoted by Water Companies for the present session were noticed. We deal to-day with some of the measures introduced by Local Authorities which contain proposals in regard to water supply.

The Bradford Corporation Bill defines the water limits and the powers of the Corporation therein. It is specifically laid down that the Corporation are not to be under obligation to supply water for other than domestic purposes, except upon such terms and conditions and at such prices as may be prescribed. They may call upon owners of buildings to take a supply of water, and connect their premises with the mains; and in the event of failure to comply with the demand, the Corporation may do the necessary work and recover the cost. Section 34 of the Bradford Water-Works Act, 1854, is to be amended, so as to make the expression "rack rent or value" mean the gross estimated rental of the premises supplied, as appearing in the valuation list. Authority is sought to borrow £15,000 for the purchase of land in connection with the water-works, to be repaid within sixty years. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Cardiff Corporation Bill is (*inter alia*) to authorize the construction of additional water-works, consisting of an impounding reservoir in the valley of the River Taff Fawr, two conduits or pipe-lines, a new road, and several road diversions. It is proposed to repeal so much of section 28 of the Act of 1879, under which the Corporation were empowered to acquire the undertaking of the Cardiff Water Company, as relates to the price to be charged for water supplied in Penarth, and to provide that the rate for domestic purposes is not to exceed that specified in section 42 of their Act of 1853, *plus* 25 per cent. The Corporation wish to be authorized to make contracts for the supply of water in bulk, and bye-laws for the prevention of pollution; also to borrow for water-works purposes, including the purchase of lands and easements, £272,000, to be repaid, so far as the money expended on works is concerned, within fifty years. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Bill promoted by the Derwent Valley Water Board is to enable them to make a deviation of an aqueduct, authorized by the Board's Act of 1904, commencing in the parish of Morley and terminating in the parish of Hopwell. The Board require an extension by five years, from the 9th of next August, of the period specified by section 63 of the Board's Act of 1899 for the completion of the Howden reservoir; and a further period of three years from the passing of the Act for the purchase of certain lands, and a like period for the completion of works by the Leicester Corporation under the above-named Act. The Board ask for the repeal of so much of section 147 of that Act as relates to the Hall Gates low-level service reservoir, and for sanction to the work being proceeded with notwithstanding the expiration of the period of ten years mentioned in the section. The Bill includes various financial provisions affecting the Board and the Leicester and Sheffield Corporations. [*Parliamentary Agents: Messrs. Dyson and Co.*]

A Bill has been promoted to obtain parliamentary authority for the constitution of a Water Board for the County of Glamorgan, for acquiring the undertakings, or parts of them, of certain companies, and for supplying water. The Board is to consist of a chairman and thirty members, representing the County Council, the Town Council of Neath, the Urban District Councils of Caerphilly, Gelligaer, Mountain Ash, Ogmore and Garw, Pontypridd, and the Rhondda, and the Rural District Councils of Llandaff and Dinas Powis, Llantrisant and Llantwit Fardre, and Penybont. The chairman is to be paid. It is proposed to acquire, as from Jan. 1, 1910, or such subsequent day as may be fixed, upon the application of the Board, by the Local Government Board, the undertakings of the Garw and Pontypridd Water Companies, and the water portions of the New Tredegar, Ogmore, and Rhymney and Aber Valleys Gas and Water Companies. The consideration in each case is to be such sum as may be agreed upon between the Board and the respective Companies, or be determined by arbitration, subject to certain provisions in the Acts of the Pontypridd and Rhymney Companies. The sum so settled may be paid wholly or partly in stock to be issued by the Board. Provision is made for the transfer to the Board of the sources of supply of certain local authorities. A standing Arbitrator is to be appointed by the Lord Chief Justice and paid by the Board, to determine questions submitted to him under the intended Act; and his decision is in all cases to be final. Authority is sought to make new works, consisting of five aqueducts, conduits, or pipe-lines, and a tramroad. The Board are to supply water to the various distributing authorities at a price not exceeding 4½d. per 1000 gallons, and not less than is sufficient to meet the estimated expenses for the current year. The Board are to provide meters, and register the quantity of water delivered. A water fund is to be established, and all receipts are to be paid into and all expenses met out of it. The Board require large borrowing powers, including a maximum of £30,060 for constructing the tramroad, and of £50,700 for carrying out the water-works specified, to be repaid within twenty and sixty years respectively from the date of borrowing. Money is to be raised by the issue of water stock, unless the Local Government Board will later consent to some other method. The stock is to be available as an investment by

trustees, and is to bear such rate of interest as the Board, with the consent of the Local Government Board, may determine. The Board require a number of miscellaneous powers, including the purchase and supply of water in bulk, the maintenance of the undertakings until the day fixed for their acquisition, the inspection of the works and books of the Companies, and for taking over and dealing with their officers and servants. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Llanelly Water Bill is to empower the Llanelly Urban District Council to construct and maintain additional water-works, and extend their limits of supply. The works consist of seven pipe-lines, which are to be completed within five years from the passing of the Act; and the proposed extension of the water area will take in certain portions of the parish of Llanelly Rural. Authority is required for the purchase of mains and pipes within the extended limits. After the completion of the works, all water supplied by the Council from their existing reservoirs is to be efficiently filtered before it is put into the mains for distribution for domestic purposes. Power is sought to hold lands necessary to prevent the fouling of water, and to fix and maintain meters and other apparatus for the detection and prevention of waste, and make bye-laws in connection therewith. The Council wish to be authorized to borrow £21,100 for the purchase of lands and the construction of works, £41,700 for the extension and improvement of the water undertaking, and the amount necessary for defraying any purchase-money and compensation payable in respect of the acquisition of mains and pipes from the Rural District Council. For the repayment of the first-named sums, fifty years are required, and thirty years for the rest. [*Parliamentary Agent: Mr. A. Rhys Roberts.*]

By the Northallerton Water Bill, power is sought by the Urban District Council to construct additional works, consisting of an impounding reservoir to be formed by a dam or embankment across the stream known as the Oak Dale Beck, five conduits or pipe-lines, two catchwaters, and other works; and to borrow £14,100 for carrying them out, and for the purchase of lands and wayleaves, to be repaid within sixty years. A period of ten years is asked within which money borrowed to defray the costs and expenses of the Act must be repaid. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Oldham Corporation require power to construct additional works, comprising a pumping-station with a receiving-tank in the parish of Butterworth, in the urban district of Milnrow, in the County of Lancaster, two wells and pumping-stations in the urban district of Saddleworth, four aqueducts or pipe-lines, a new road, and a footpath—all to be completed within five years. The Corporation seek authority to borrow £80,000 for the purchase of lands and wayleaves and for constructing the works named, and £50,000 for new mains, extensions, service-pipes, and meters; to be repaid in sixty and forty years respectively. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The Bill promoted by the Risca Urban District Council is to authorize the transfer to them of the undertaking of the Western Valleys (Monmouthshire) Water and Gas Company, the construction of additional water-works, and the supply of water and gas in their district and in adjacent places. The general scope of the Bill was indicated when noticing the gas portion in the "JOURNAL" for the 2nd inst. (p. 302). The present works consist of a reservoir, a tank in the parish and urban district of Risca, six intakes, and seven conduits or pipe-lines; and it is proposed to construct a tunnel or adit in the valley of the Cwm Carn, and a conduit or pipe-line from it, passing through the parish and urban district of Abercarn, and terminating in the tank now in existence in the parish of Henllys. Five years are required for the completion of these works. The limits of water supply are to be the whole of the parish and urban district of Risca, and some portions of the urban district of Mynyddislwyn, and of the parish of Machen Upper, in the rural district of St. Mellons. The rates chargeable are not to exceed those which are specified in the Company's Act of 1891, and set forth in a schedule to the Bill. They are based on the rateable value of the premises supplied. Where this is not higher than £4 per annum, the charge is to be 2d. per week; above £4 and up to £7, 3d.; above £7 and up to £10, 4d. Premises rated higher than this are to be charged upon a percentage, decreasing with the increase in the value. For an extra closet 7s. 6d., and for a fixed bath 10s. 6d., per annum may be charged. The price of water supplied by meter is not to exceed 2s. per 1000 gallons. Authority is required to borrow £8500 for the construction of the water-works specified, to be repaid within sixty years from the date or dates of borrowing. The other water clauses are of the usual character. [*Parliamentary Agents: Messrs. Lees and Co.*]

It is proposed to constitute and incorporate a Water Board for the urban districts of Stourbridge, Lye, and Wollescote, in the county of Worcester, and Amblecote, in the county of Stafford, and for portions of the rural districts of Bromsgrove and Kingswinford; and authority is sought by the Stourbridge and District Water Board Bill for the transfer to the Board of the undertaking of the Stourbridge Water Company, and for the construction of additional works. The proposed Board is to consist of fifteen members, who are to be elected within eight weeks from the date of the passing of the Act, or within such further time as the Local Government Board shall allow; and they are to remain in office until April 28, 1911. The method of election, the conditions of membership, and other matters bearing upon the constitution and duties of the Board and its officers, are fully set out in the Bill. The consideration to be paid for the undertaking is to be such an amount of Stourbridge and District "A" water stock as will yield an aggregate dividend equal to the maximum dividends on the capital of the Company to which the shareholders were entitled at the date of the Provisional Order of 1908, *plus* £2000 of such stock. Confirmation is sought for the construction of the existing works, and also authority to make new ones, consisting of a pumping-station in the urban district of Stourbridge, a covered service reservoir in the township of Upper Swinford, in the same district, and three pipe-lines—all to be completed within five years from the passing of the Act. The limits of supply are to be the respective districts of the Stourbridge, Lye and Wollescote, and Amblecote Urban District Councils, the parishes of Pedmore, Hagley, and Clent, in the Bromsgrove district, and the parish and rural district of Kingswinford. The rates are to be based on the rateable value of the premises supplied, as set forth in a schedule to the Bill. Where water is furnished by meter, the price is not to exceed 2s. per 1000 gallons. Borrowing powers to the amount of £10,800 are required for the purchase of land and the construction of works; £5200 is wanted for new mains, extensions, services, &c.; £2000 for working capital; and whatever amount it may be necessary to pay the Company in connection with the transfer of their undertaking and to defray the expenses of the Act and of the Councils' opposition to the Order of 1908. The Board require the powers usually granted to suppliers of water. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Wakefield Corporation ask for an extension by ten years from the passing of the Act for which they are applying, of the period limited by their Act of 1889 for the completion of such of the works thereby authorized as have not been finished. The other provisions relating to water supply contained in the General Bill they promote include power to proceed against persons who wilfully injure meters or fittings. They wish for authority to borrow £150,000 for the completion of the works indicated, to be repaid within sixty years. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Watford Urban District Council Bill is, among other things, to authorize the Council to extend their limits of water supply, so as to include as much of their district as is not at present within the limits of the Colne Valley Water Company. Power is required to maintain the present works and construct others, consisting of a well and pumping-station adjoining those now existing, a reservoir in the parish of Bushey, a conduit or pipe-line connecting them, and another leading from the reservoir to the junction of High Street, Watford, and the St. Albans Road. A period of ten years is asked in which to carry out these works. The rates for the supply of water are to be based upon the rateable value of the premises; 8s. 8d. per annum where this is less than £5, and 5 per cent. where more. The expression "domestic purposes" is to be deemed to include water-closets, and baths so constructed as to be capable of containing not more than 80 gallons when filled up to the overflow pipe, but to exclude washing carriages, watering gardens, and a number of other purposes specified. The Council wish to be empowered to supply water by measure; and a builder is to be entitled to ask to be furnished with a supply in this way. The rate, however, is not to exceed 9s. per cent. of the probable total cost of the premises, after making such allowance as the Council may think reasonable for decorative or iron or steel work not requiring the use of water. Borrowing powers are required to an amount not exceeding £90,100 for the purchase of land and the construction of water-works, and £24,178 for mains and other works; to be repaid in sixty and thirty years respectively from the date or dates of borrowing. [*Parliamentary Agents: Messrs. Baker and Co.*]

A Simple Pipe-Flow Formula.

In a recent number of "Engineering Record," Mr. C. C. Vermeule gave a formula for computing the discharge from a pipe, which he submitted as being so simple that it could be quite readily remembered and worked out in a field, in the absence of tables, &c. It was as follows:—

$$Q = 25D^2\sqrt{Ds}, \text{ or}$$
$$Q = 0{\cdot}05d^2\sqrt{ds}$$

where

Q = discharge in million gallons daily.
s = slope or loss of head per unit of length.
D = diameter of pipe in feet.
d = diameter of pipe in inches.

Mr. Vermeule claims that the formula is so simple that by it results may frequently be worked out mentally with sufficient accuracy for ordinary purposes.

"Transactions" of the New England Gas Association.—We have received from Mr. N. W. Gifford, the Secretary of the New England Association of Gas Engineers, the "Transactions" of the Association for the three years 1906-8. The volume contains the papers submitted at the meetings, which were held in Boston, with verbatim reports of the general proceedings and of the discussions. The subjects in the "Question Box" are of a varied and useful character. Some of the papers are illustrated; and portraits are given of two of the Presidents (Colonel F. S. Richardson and Mr. William M'Gregor) as frontispieces. There are short notices of deceased members, and also lists of those now on the roll and of Presidents and officers.

ELECTRIC COOKING.

Now and again a little splash is made over electric cooking; but the heat units of the fuel used in generating the electricity obtain such a small representation at the point of service that, combined with the initial cost of the cooking apparatus, the expense of upkeep, the inefficiency, and the unreliability, there has been little response to the bids for favour. The Borough Electrical Engineer of Partick (Mr. W. Sillery), aided by the exertions of his Mains Superintendent (Mr. P. Wilson), has brought out what is described as the largest electric oven in the country; and as though it denoted a favourable longevity, it is announced that the oven has been in use since December, 1908! The outside dimensions of the structure are 6 feet high, 4 ft. 8 in. wide, and 32 in. deep. There are two independent ovens for roasting or baking, and a plate warmer is on top. The inside size of the top oven is 4 ft. 3½ in. by 1 ft. 10¾ in. by 17 in.; and the door opening is 2 ft. 10 in. by 1 ft. 2 in. The inside size of the bottom oven is 4 ft. 3½ in. by 1 ft. 10¾ in. by 14⅝ in.; the door opening being 2 ft. 10 in. by 1 ft. 2 in. We would suggest that these ovens are much too shallow for roasting anything but small joints of meat or larger ones in the form of slabs; and that there will be trouble from the closeness of the heated top and bottom to the joints.

"The current consumption when in use" (of course no one would assume the oven consumes anything when not in use), says the "Electrician," is 3½ units per hour, and the maximum possible consumption only amounts to 6 units per hour. "Advocates of electric cooking will doubtless be pleased to hear that Mr. Sillery finds that the cost of electric cooking with current at 1d. a unit, as at Partick, is much below that at which gas can ever hope to compete, while, in addition, there is increased cleanliness, safety, and convenience." The statement is beautifully vague; and, of course, as we can never, according to the sanguine Mr. Sillery, "hope to compete" now, we may as well recognize the fact, and, with the best grace possible, take a back seat. Mr. Sillery, however, does not favour us with the details as to the basis of his comparison; and as condemned men usually have a certain amount of leniency shown them, he may as well supply these details to us, to see if we cannot find some loophole for escape. Meanwhile there seems to be something wrong with that 1d. per unit for cooking. At one time, electrical engineers were sticklers for principles. Among their professional tenets was formerly one which directed that prices for electricity should fine-down as consumption bulked-up and the hours of maximum load became longer. A cooking-stove must be a very short-hour consumer; and when an oven only consumes 3½ units per hour (or a maximum of 6 units), it cannot be said to be a very large consumer. Therefore why the oven should have the special consideration of electricity at 1d. per unit, and the old principle be so disrespectfully and disgracefully treated, we do not know. But there it is. It just occurs to us, though, that at Partick not far short of 220 cubic feet of gas can be obtained for the price of 6 units of electricity at 1d. per unit. Using gas at this rate per hour in Mr. Sillery's oven—well, we should certainly pity the oven, and all that happened to be in it.

WORKMEN'S COMPENSATION CASES.*

Under the title of "Butterworth's Workmen's Compensation Cases," Vol. I. of a new series of reports of decisions under the Acts relating to compensation to workmen for injuries received in the course of their employment, has just been issued. The volume includes a lot of decisions not only of the English County Courts and the Court of Appeal, but also the more instructive and important cases from Scottish and Irish Courts; and even ten cases from the County and Supreme Courts of British Columbia. An ample index to the subject-matter of all the previous volumes greatly facilitates reference, and will make the book one of great usefulness to the legal practitioner, as well as to those, in industrial concerns, who sooner or later are bound to be brought into contact with questions of workmen's compensation.

In glancing through the present volume of reports, we are again reminded of the difficulties that have been experienced in answering the simple question, What is an accident? The case involving once more the consideration of this conundrum is that of *Neville v. Kelly Brothers and Mitchell, Limited*, from the Supreme Court of British Columbia, and reported at p. 432. A workman who was engaged in chipping, with hammer and cold chisel, burs from a steel plate, had the misfortune to have a piece of the chipping strike one of his eyes and destroy its sight. Was this an accident, or was it a liability that was to be expected from the nature of the man's work? It was held on appeal, affirming the previous decision, that it was an accident; and the three learned Judges before whom the case came referred to *Thompson v. Ashington Coal Company* (1901, 3 W.C.C. 21), where our Master of the Rolls (A. L. Smith) used the useful defining words "what happened was fortuitous and unexpected;" and Mathew, L. J., who, in *Boardman v. Scott and Whitworth* (1902, 4 W.C.C. 1), said "we must discriminate between that which must occur and that which need not necessarily occur in the course of the employment;" and, lastly, the late Lord Robertson, who pointed out, in *Fenton v. Thorley and Co., Limited* (1903, 5 W.C.C. 1), that "the word 'accident' is not made inappropriate by the fact that the man hurt himself." So here we have a useful summary of what is an "accident."

In the volume under review appear authorities that extend the meaning of the word "accident," beyond what, perhaps, the average man would ordinarily regard as such. Thus, where a workman already suffering from a slight rupture, and having in the course of his work to exert an unusual strain which resulted in increasing the rupture, it was held by his Honour Judge H. Tindal Atkinson to be an accident within the meaning of the Act of 1906 (*Fulford v. Northfleet Coal and Ballast Company*, 1 [N.S.] W.C.C. 222). So also in the case of over-exertion bringing on cerebral hæmorrhage, it was held by the Court of Session, to be an accident (*M'Innes v. Dunsmuir and Jackson, Limited*, 1 [N.S.] W.C.C. 226). Another similar instance is where a man was engaged in drawing ashes from a ship's furnaces and had a "heat-stroke." The House of Lords said it was personal injury by accident (*Ismay, Imrie, and Co. v. Williamson*, 1 [N.S.] W.C.C. 232). These instances show the natural and logical extension of the definition of "accident" already referred to.

Another phrase on which disputes arise, and on which many decisions have been given, is that in section 1 (1) of the Act—"accident arising out of, and in the course of, the employment." Upon this, on p. 201 of the new volume, Buckley, L. J., makes some pointed observations in his judgment in *Fitzgerald v. Clarke and Son* (1 [N.S.] W.C.C. 197). He says the words "are used conjunctively, not disjunctively; and upon ordinary principles of construction are not to be read as meaning 'out of'—that is to say, 'in the course of' . . . . The workman must satisfy both the one and the other." It is said that "hard cases make good law;" but the hardness of the strict interpretation of this phrase is shown in the case of *Mullen v. Stewart and Co., Limited* (Court of Session, 1 [N.S.] W.C.C. 204). There a workman lost one of his feet in trying to save a fellow workman who had seized, in a spirit of play, a rope hauling a loaded bogie, and who had fallen. The two workmen were returning to work after going away for refreshment after working overtime till 9 p.m. It was held that the injured applicant for compensation could not succeed, as the accident did not arise out of his employment.

Other interesting reports in this collection show that going for pay is in the course of the employment (*Lawry v. Sheffield Coal Company, Limited*, 1 [N.S.] W.C.C. 1); also going to work after receiving wages (*Nelson v. Belfast Corporation*, 1 [N.S.] W.C.C. 158, Court of Appeal, Ireland); and also, by the same Court, when using a short cut in leaving the employer's works instead of using the more usual way (*M'Kee and Others v. Great Northern Railway Company*, 1 [N.S.] W.C.C. 165). But if the workman leaves without permission and an accident happens to him it is not one "arising out of and in the course of the employment" (*Martin v. Fullerton and Co.* 1 [N.S.], 168, Court of Session).

A workman is defined by section 13 of the Act to be "any person who has entered into, or works under, a contract of service or apprenticeship with an employer." A rather hard decision is recorded in this volume, on p. 317 (*Whitbread v. Arnold*). A man entered into a contract with a farmer to be his servant from a given day, and, in accordance with custom, the farmer sent on that day a waggon to fetch the man, his family, and belongings. When forty yards from his new home, the waggon suddenly jerked, and the man was thrown down and received fatal injuries. His Honour Judge Ruegg (the editor of the reports), before whom the case came, decided that the relationship of employer and workman existed at the time of the accident; but the Court of Appeal held that the employment had not commenced.

Upon the question of amount of compensation, average weekly earnings, and the method of ascertaining the same from what is paid to workmen of the same "grade," a set of three appeals is collected on p. 351; but we need not consider these in detail, except to say that by the word "grade" is not meant the grouping of men into good or bad workers. "That word does not involve or depend upon individual characteristics." (Cozens-Hardy, M.R., in *Perry v. Wright*, 1 [N.S] W.C.C. 363, on p. 365.)

Two cases are reported in which gas companies are concerned. There is the House of Lords decision in *Cleverley and Others v. The Gaslight and Coke Company* (erroneously described as "Limited"), upholding the Court of Appeal in the view that an agreement under which the employers had paid a workman compensation did not estop them from denying liability in respect of his death, which was caused by disease and not by accident. The other gas case is that of *Cogdon v. Sunderland Gas Company*, in which a workman engaged on repairing a service-pipe in a private house asked leave of the chargeman to go to a place of convenience. He went to a house 214 yards away, where he broke his ankle. Almost needless to say, it was held that the accident did not arise out of, and in the course of, the employment.

From the few extracts that have been given, it will be seen that the volume is full of important and interesting decisions and points; and we can recommend its perusal to all who are likely to be concerned in the administration of the Workmen's Compensation Act.

* "Butterworth's Workmen's Compensation Cases." Vol. I. (New Series). Being a Continuation of "Workmen's Compensation Cases," Vols. I.-IX., edited by the late R. M. Minton-Senhouse, of the Inner Temple and Midland Circuit, Barrister-at-Law. Containing Reports of Cases decided under the Workmen's Compensation Acts, September, 1907, to August, 1908. Edited by His Honour Judge Ruegg, K.C., and F. J. Coltman, of the Inner Temple and Midland Circuit, Barrister-at-Law. London: Butterworth and Co.; 1909. [Price 7s. 6d. net.]

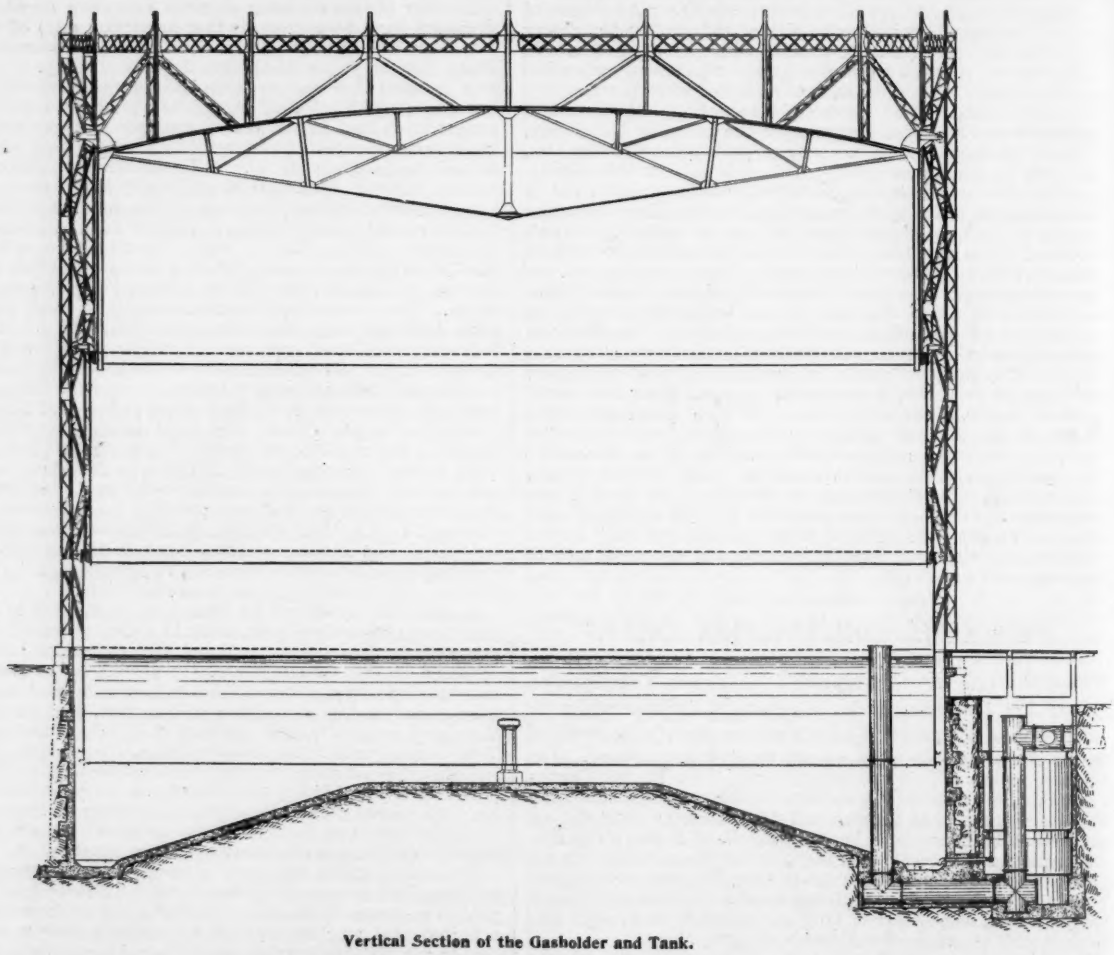
A LARGE GASHOLDER TANK AT TURIN, IN REINFORCED CONCRETE,

ON THE HENNEBIQUE SYSTEM.

THE Gaslight Consumers' Company of the City of Turin (La Società Anonima Consumatori Gas-Luce della Città di Torino) has taken advantage of the recent enlargement of its fine and modern works on the Corso Regina Margherita to adopt many modern appliances which are remarkable for their perfection. This statement applies not only to the machinery installed, but also to innovations which have been made in methods of construction. Reinforced concrete, according to most modern practice has been adopted in all the work executed. For the particulars given we are indebted to Signor Rag. Giacomo Beria.

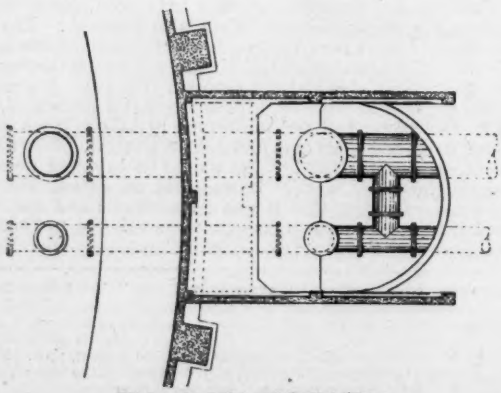
Among these works, the most important is a large gasholder tank of 41·53 metres (136 feet) internal diameter, and with a depth of 10·20 metres (33 ft. 6 in.) below the water level. This has been carried out entirely in reinforced concrete by the Porcheddu Engineering Company, who are the agents for the Hennebique patents in Italy. The very great success of this novelty in construction in comparison with ordinary systems, and the economical and technical advantages which it has presented in the course of the execution and testing of the work, are worth putting on record for the information of others interested in gas-works plant. The gasholder tank shown is for a new holder of 35,000 cubic metres (about 1,236,000 cubic feet) capacity. The addition of a holder of this capacity to the five existing holders on the works, will admit of the daily make being increased to about 100,000 cubic metres (3½ million cubic feet) of gas. The three-lift gasholder now in course of erection in the tank is being constructed by Messrs. Samuel Cutler and Sons, of Millwall. The guide-framing is on the well-known Cutler system, on which the firm have erected six examples during the past two years in Italy. The Gas Company of Turin reserved to themselves the construction of the tank in masonry or concrete. The Engineers of the Company were impelled by modern developments to undertake a comparison of reinforced concrete with ordinary construction. An examination of a number of plans obtained from important cities served to confirm the advantages of reinforced concrete construction, and, further, to give preference to the type exploited by the Porcheddu Engineering Company, which is described in the sequel with the principal details of construction.

The tank, instead of being built in the ordinary way of thick



Vertical Section of the Gasholder and Tank.

walls of ordinary cement concrete or brickwork, is constructed of walls of cement of very slight thickness into which are introduced numerous bands of iron calculated to resist all the strains which can be determined for the bottom and sides. The bottom of the tank consists of a continuous slab of reinforced concrete resting on firm excavated ground. Fig. 1 shows the manner in which the bottom has been carried out in the form of an internal truncated cone, and indicates the manner in which the metal has been disposed in it. A special series of iron bars run from the centre towards the columns at the circumference of the tank, while other iron bands form concentric hoops in the walls and top of the central truncated cone. Other smaller iron bars are placed to form a network with those mentioned; and these complete the reinforcing of the bottom. The bottom of the tank was designed not merely with a view to securing a uniformly consolidated base to carry the weight of the water when the tank was filled, but also so that the base should be capable of resisting any upward pressure of the underground water which might occur when the tank was due to be emptied. The tank was planned at such a level as to be very nearly that of the ordinary level of the



Pit for the Inlet and Outlet Pipes.

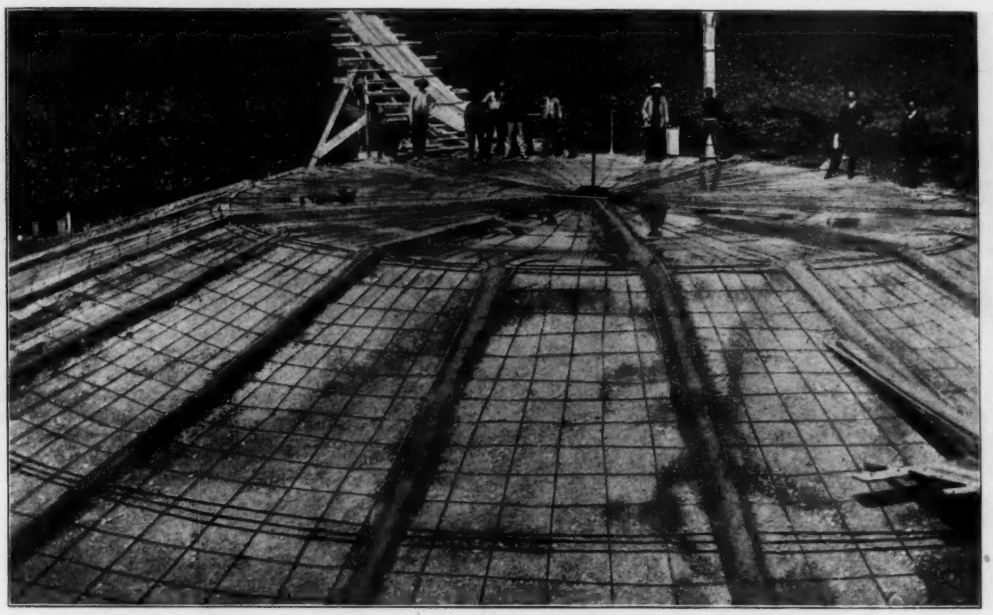


Fig. 1.—Network of Iron on the Dumpling, in the Form of a Truncated Cone, at the Bottom of the Tank.

underground water. But in rainy periods, a rise in the water level in the soil, which is gravelly and porous, might cause an appreciable upward pressure.

In designing the construction of the walls of the tank it was decided to make the sides in the form of a thin cylinder strengthened by horizontal bands. One of these bands is on a level with the bottom of the tank, and five others are placed at increasing distances apart from the bottom to the top. The continuous cylindrical wall is 40 cm. (15¾ in.) thick at the bottom, and 20 cm. (8 in.) thick at the top. In the wall, and in the strengthening bands, numerous iron plates or bars are inserted, partly to form rings and partly to form a continuous spiral round the tank. Some of these are joined by screwing into a double socket, others by welding, and the rest by firm ties. The columns placed at the circumference for mounting the iron framing were not calculated as true buttresses for the wall, but simply as sustaining ribs and as foundations for the iron guide framing to take up the strains resulting from the action of the wind on the bell. The contract conditions specified that the tank should be capable of sustaining the internal thrust of its contents of water without the assistance of the earth which was to be built up against the outside of the walls. The work was therefore carried out in the extremely unusual manner that the tank was completely filled before the outer walls were earthed-up. It was kept thus, full of water, for about ten days; and the tank walls being left open on the outside, were examined all round to make sure of their good condition. This test having proved satisfactory, the tank was emptied and was earthed-up on the outside.

The tank was constructed with the utmost celerity between May and September, 1908. As the work proceeded, special importance was given to the carrying out of the wood-work framing or the reinforcing iron work for the walls. Fig. 2 shows a portion of the elevation of the cylindrical drum against which the internal face of the tank was formed. This construction imposed the observance of the greatest precision in setting out the interior circular base horizontally, and also entailed the wall of the cylinder being perfectly vertical. These conditions are not readily fulfilled in casting a cylindrical drum in concrete over 130 metres (426 ft. 6 in.) in circumference, and with a height of 10·2 metres (33 ft. 6 in.). For this reason, the framing was erected in such a manner that all the small deviations, which were liable to occur as a result of the trifling movement to which, from different causes, such an extent of wood framing would be liable, could be rectified while the work was in progress. In this way, the required precision for the finished work was secured.

The first inside cylinder, 7 metres (23 feet) in height, is shown in the illustration, fig. 2. On it was erected a second cylinder of 3·2 metres (10 ft. 6 in.) to complete the full height of 10 metres (33 ft. 6 in.). The ironwork forming the reinforcing structure was first placed round the inner cylinder in the space left for the wall and the strengthening bands. It was then in turn incorporated in the concrete, which was cast in the space. This ironwork was required to sustain the pressure of the water in the different zones into which the wall could be regarded as divided by the encircling bands. It was very extensive and ample, having regard to the large margin of strength which was allowed in view of this being the first application of this system of construction to such large work. The various zones of the vertical wall were calculated to withstand, as already mentioned, the thrust of the water without the aid of the counterthrust of the earth outside the tank. The calculation was made exactly as for tubes or hollow cylinders. The tension in each zone was taken as the total tension which would be produced in the two sections into which it would be cut by a vertical plane passing through

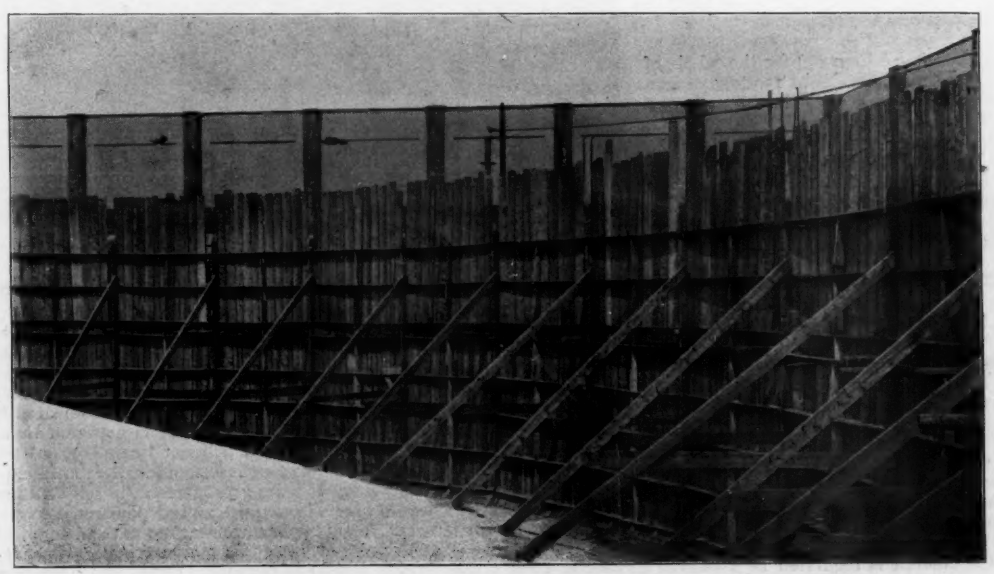


Fig. 2.—Interior of the Vertical Framing for the Wall—First Portion of the Cylindrical Drum, up to a Height of 23 Feet from the Bottom.

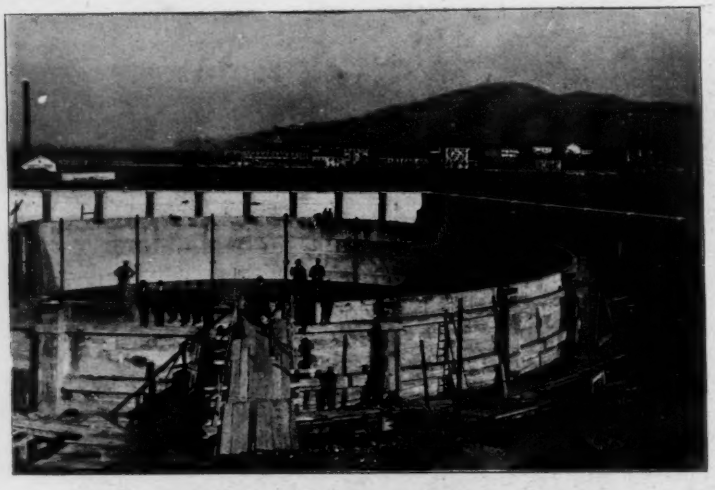


Fig. 3.—View of the Tank before Earthing-Up the Outside.

attached to the rim of the tank. In addition to the mains leading to the holder, this pit contains also a pipe for discharging the tank, starting from the lowest point and rising to the level of the opening into the works' sewers. This will facilitate the changing of the water in the tank, and, when required, the emptying of the latter.

The Gas Company, through the successful adoption of these new methods of construction, have achieved a distinct saving, as well as greater reliability and rapidity of execution. The cost of the work in reinforced concrete proved to be about 50 per cent. below what it would have been if the ordinary system of walling had been followed.

The work is, moreover, certainly the most notable which has been carried out in reinforced concrete up to the present. The successful result therefore reflects great credit both on the constructing firm, and, in particular, on the able Managers of the Gas Company, who, by their knowledge and up-to-date methods, are bringing prosperity to one of the most perfect works devoted to gas supply.

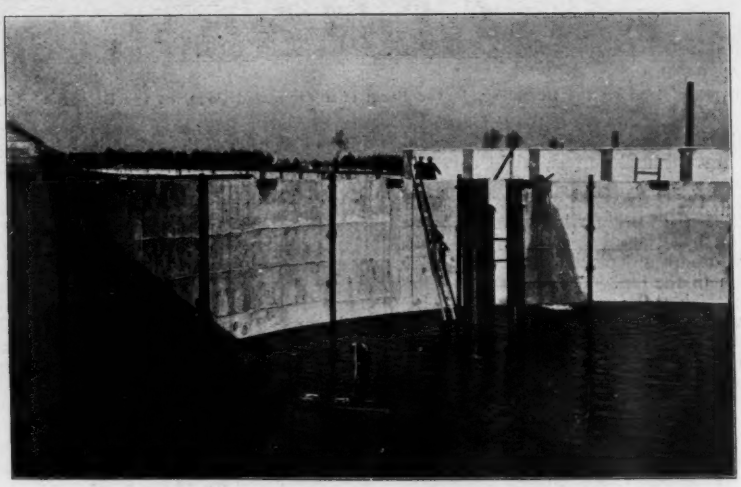


Fig. 4.—Interior of the Tank when Half-Filled.

the axis. The total tension in the first zone, starting at the base, may be found from the following expression:—

Zone from the first band:

$$\frac{1{\cdot}10}{2} + 0{\cdot}70 + \frac{1{\cdot}10}{2} = 1{\cdot}80 \text{ metres.}$$

Pressure per linear metre:

$$500 \times (9{\cdot}35^2 - 7{\cdot}55^2) = 15{,}200 \text{ kilos.}$$

Total tension exerted on the first zone:

$$15{,}200 \times 41{\cdot}6 = 635{,}000 \text{ kilos.}$$

Calculating thus (zone by zone) for the whole of the tank, it was found that about 150 tons of iron in the aggregate had to be used in the walls and bottom of the tank.

In addition to the large tank, the pit for the main-pipes leading to the holder was carried out in reinforced concrete. This pit is independent of the large tank throughout its elevation, and is only connected to the latter by its bottom resting on the same foundation slab, and by its top being

Fig. 5.—The Tank Filled.

In the Library of the Royal Institution, on the occasion of the lecture by Professor Wilson on the "Electrical Properties of Gas," noticed elsewhere, there were on view several new instruments of interest to gas engineers. For indicating temperatures above 600° C. (1112° Fahr.), Messrs. Siemens' Bros. and Co., Limited, have brought out an optical pyrometer. The telescope of the instrument is directed on the hot body, such as the sight-hole of a furnace, when the field of vision appears brightly illuminated. The filament of an incandescent lamp passes across the line of vision inside the telescope; and so long as no current flows through it, the filament appears as a dark line on the bright background. The lamp is now switched into the circuit of a small accumulator, and the current is regulated by means of a rheostat until the incandescent filament becomes invisible on the bright background. The temperature of the filament is then the same as that of the furnace. By means of a milli-ampere meter, the electrical quantity is observed; and this is connoted with a scale of temperatures graduated upon an adjoining indicator. Messrs. Townson and Mercer exhibited Lucas's patent gas-heated furnace—an appliance in which the blast of air is actuated by a steam-jet, supplied with steam from a boiler heated by a gas-ring. The supply of gas to this ring is automatically controlled by the use of the furnace. It is an arrangement, in self-contained form, of what would otherwise require an independently driven power fan or blower. The temperature reached in the demonstration, using gas at the rate of 150 cubic feet per hour, was that of melting cast iron in a Morgan crucible. Other instruments of precision concerned with light and spectroscopy made use of gas-flames.

PROGRESS IN CONSTRUCTIONAL GAS ENGINEERING IN GERMANY.

First Article.

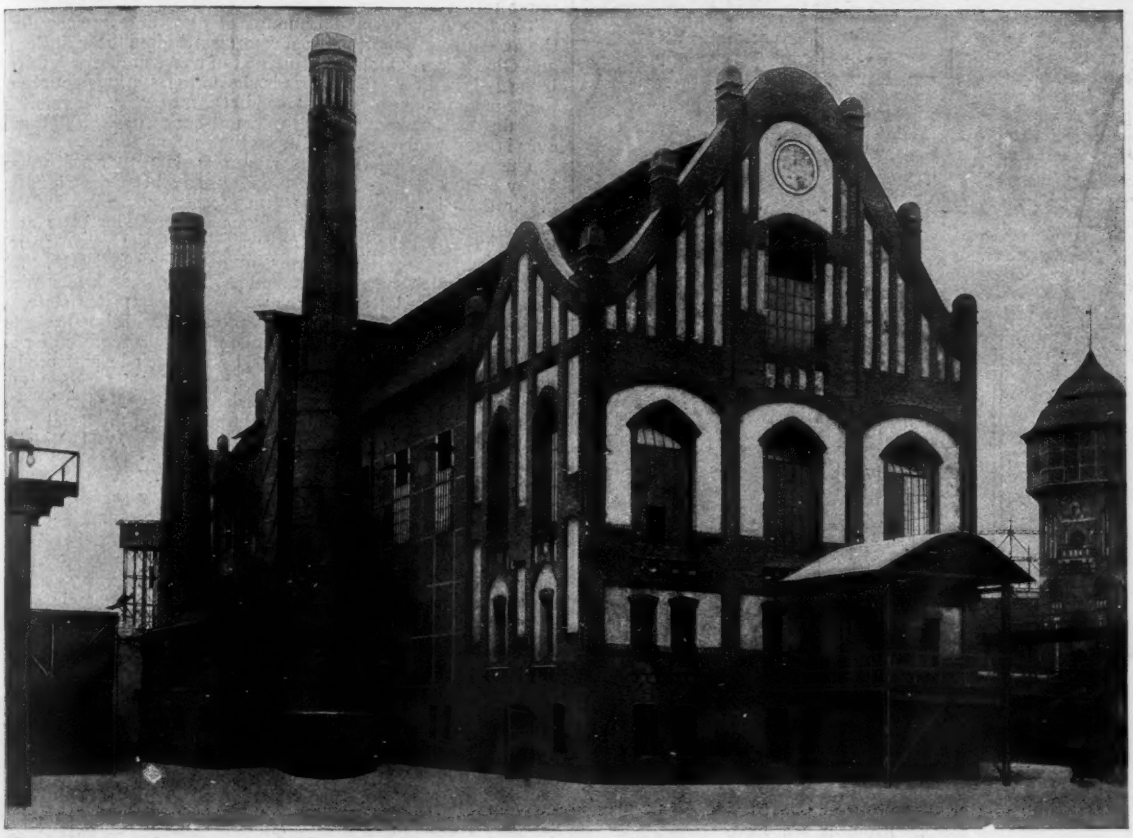


Fig. 1.—Iron-Frame Retort-House for Inclined Retorts (Drory System) at Gorlitz.

We have received from the "Berlin-Anhaltische Maschinenbau Actien Gesellchaft" (Berlin-Anhalt Engineering Company) a copy of an album which the firm have just issued, giving over 700 illustrations of plant and apparatus constructed by them within the last six years. The illustrations, with brief explanations and descriptions, fill some 350 pages. The Company own works at Berlin, Dessau, and Benrath, near Dusseldorf—the last named having been taken over in recent years. They also have a working agreement with the well-known Stettin Fire-Brick Works, founded by Herr Didier. This agreement is very valuable in securing contracts for the complete equipment of new gas-works or the entire reconstruction of old ones. The Company either own or make, under agreement, a large proportion of the best-known novelties in connection with gas manufacture which have been introduced in Germany in recent years, as will appear from the following account of some of the more important pieces of constructional work or apparatus they have carried out. The illustrations are reproduced from the album referred to merely to afford English gas engineers an opportunity of judging what types of apparatus and class of construction are being put into modern Continental gas-works by a leading firm. They do not

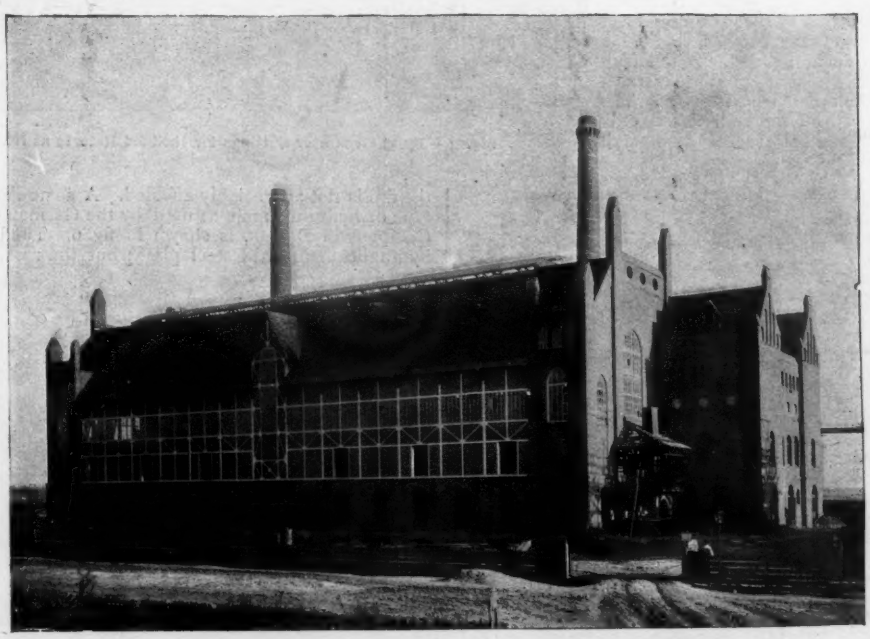


Fig. 2.—Iron-Frame Retort-House for Inclined Retorts (Bernhard System) at Rixdorf.

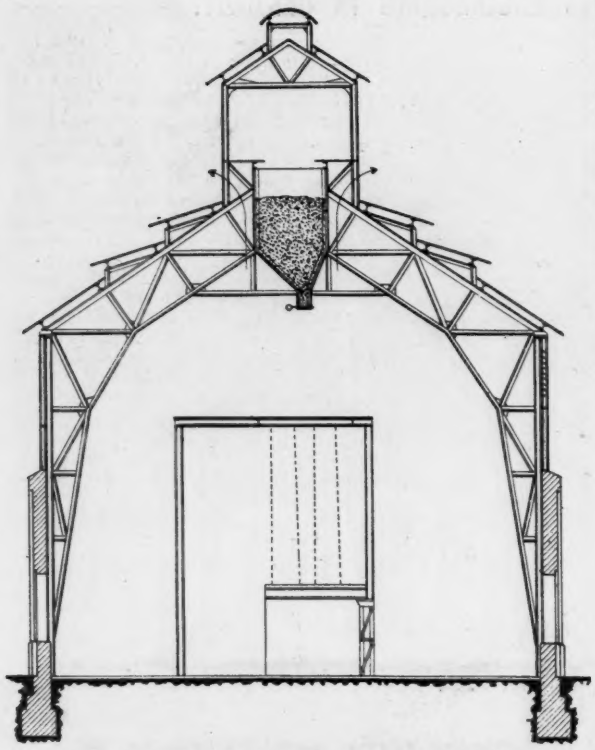


Fig. 3.—Vertical Retort-House, with Coal Store in Roof.

necessarily indicate the extent or scope of the work undertaken; they have been selected primarily with regard to points of novelty they are likely to present to English gas men.

The first section of the album is devoted to iron-work buildings and roofs. From it we have selected the illustration, fig. 1, of an iron-frame retort-house for inclined retort-settings erected at the Hennersdorf works at Görlitz, to show the architectural possibilities of this class of construction as applied to such buildings. This type of design for inclined retort-houses is identified in Germany with the name of Herr Edward Drory. Ordinarily, the retort-houses are constructed wholly with an iron-work framing; but occasionally, on æsthetic grounds, the end walls are pure masonry. Generally, they are arranged for two parallel benches of settings; but in some instances a single row of settings has been erected in a house of this construction. The type of house in question is light, roomy, and airy.

A somewhat similar type of iron-frame retort-house for inclined retorts is that designed by Herr Bernhard. Fig. 2 shows an example of this which occurs at the gas-works at Rixdorf. In this construction, the whole of the lateral pressure is transferred to the foundations of the benches. The foundations of the walls of the house carry only the vertical load. The coal receptacles as well as the charging-floor are supported from the main ties or trusses only. The fixed roof is open in the middle to allow the escape of smoke; the opening being covered by a tipping roof which, by means of a wire rope and winch, can be turned to one side or the other according to the direction of the wind.

The firm have erected a number of retort-houses specially for the accommodation of vertical retorts, including those at Cologne and Oberspree. One simple method of construction which is now being followed for such houses is shown in fig. 3, in which the coal bunkers and conveyors are placed in the framing of the roof. The coal dust is thus kept out of the retort-house itself, which moreover is thoroughly ventilated from the roof, as shown.

The second section of the album deals with retort-settings. Many of the settings shown have already been described with illustrations in the "JOURNAL" in recent years. Among these, may be mentioned the installations of vertical retorts at the Cologne Gas-Works (see "JOURNAL," Vol. XCVIII., pp. 810, 1000) and at Oberspree, Berlin (see "JOURNAL," Vol. XCVIII., p. 804) and the Munich oven carbonizers at the Grasbrook Gas-Works, Hamburg. The latter are now shown in a completed state. An interesting type of setting is that adopted for inclined retorts at the Helsingfors Gas-Works in which the height required for such settings is reduced to a minimum by the use of squat producer furnaces and beds. The charging stage of the Helsingfors retort-house is shown in fig. 4. At the close of this section the Jerratsch retort, having detachable end-pieces in place of the usual flanges to which the mouthpieces are bolted, is shown. The Jerratsch retort was described and illustrated in the "JOURNAL" a short time ago (Vol. XCV., p. 831).

The third section shows the equipment of retort-settings—such as dampers, mouthpieces, hydraulic mains, ascension and dip pipes, &c. Many types of hydraulic main are shown; one of the best known on the Continent being the Hasse pattern seen in fig. 5. This type has the advantage of accessibility while the retorts are in use, so that obstructions of thick tar may be readily removed. The cleaning openings and the dip-pipes are provided with special angular self-sealing lids; and in the cleaning passage there are partition walls at frequent intervals. Thus, when a lid is removed, the sealing liquid only rises in the one section, and the dip is not appreciably affected. A somewhat similar simple type of hydraulic main as used by the German Continental Gas Company of Dessau, is shown in fig. 6. The back wall of this hydraulic main is of steel plate; but the rest of the walls are

Fig. 4.—Squat Generator Settings for Inclined Retorts at Helsingfors.

Fig. 5.—Hasse Hydraulic Main.

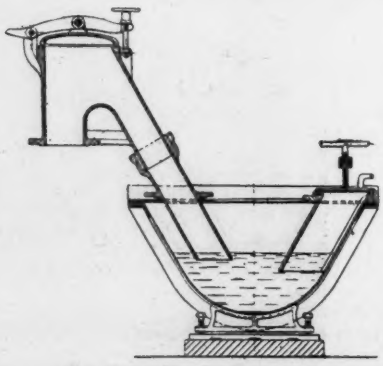


Fig. 6.—Dessau Hydraulic Main.

castings. An interesting item is the hydraulic main for the Munich type of oven carbonizers, which is shown in fig. 7. The hydraulic main proper is of wrought iron, of circular cross-section. The cleansing openings are of cast iron. The gas passes upward from the hydraulic main to the foul main seen in the illustration, while the liquor and tar pass off through tar separating overflows

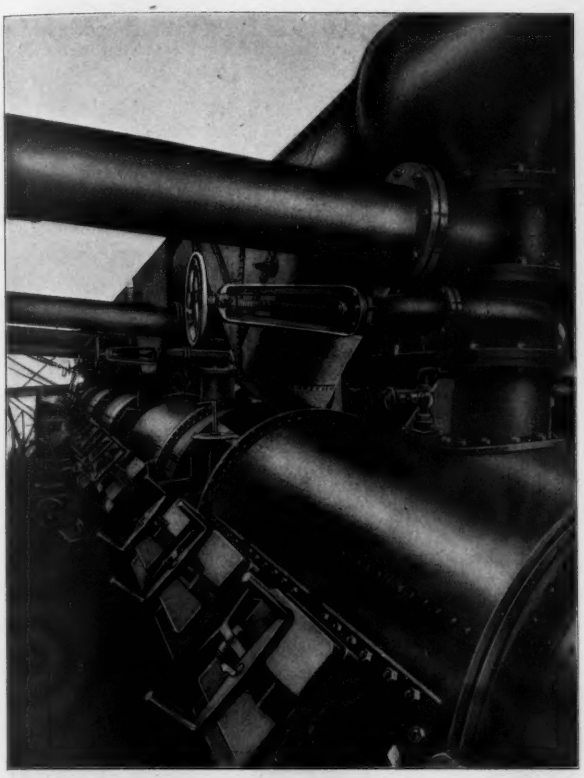


Fig. 7.—Hydraulic Main for Munich Chambers.

at the side. Among the many other interesting items of apparatus shown in this section are the Drory tar-overflow with variable level, and the Irminger head-piece for ascension pipes, for facilitating the removal of obstructions in the pipes.

The fourth section refers to coal-conveying plant, and includes the railway equipment and band conveyors in use at the Zurich Gas-Works, which have already been fully described in the "JOURNAL" (Vol. LXXVII., p. 20 *et seq.*) and in the account of the Zurich New Gas-Works, by Herr A. Weiss, as published at the "JOURNAL" offices. Various railway waggon tips are described; one of the most interesting being that shown in fig. 8 which is in use at the Nuremberg Gas-Works. This waggon tipper is worked by an electro-motor, and is used in conjunction with an elevator for raising the waggons to a high level, so that the coal may be directly discharged into elevated coal-bunkers. There are numerous illustrations of rope-conveying plant and of the transmission of power by means of ropes for the handling of railway waggons on works' sidings. The same section naturally includes descriptions of various types of grabs and cranes, some of the installations of which are to be found in gas-works in the Far East and in Scandinavia. Several examples of the Bradley bucket conveyor in use in various gas-works on the Continent are shown. The section concludes with a description of weighing machines and coal breakers.

The fifth section comprises illustrations of coke conveyors of which, of course, the De Brouwer trough takes priority of place. Many of the examples of this conveyor in use in Continental gas-works which are given have been shown in past volumes of the "JOURNAL," as for example those at the Mariendorf and Oberspree works (Vol. CII., p. 622), and Hamburg (Vol. CIV., p. 194). The Oberspree conveyor is in connection with the installation of vertical retorts there, and the Hamburg conveyor has been specially arranged to deal with the large quantities of coke which are liberated in a short time when the carbonizing ovens at the Grasbrook works in that city are being discharged. The Merz conveying trough is in use at the Cassel and the Amsterdam Gas-Works, among others on the Continent. It is of the rake type. The Bamag-Marshall grid conveyor is, as the word

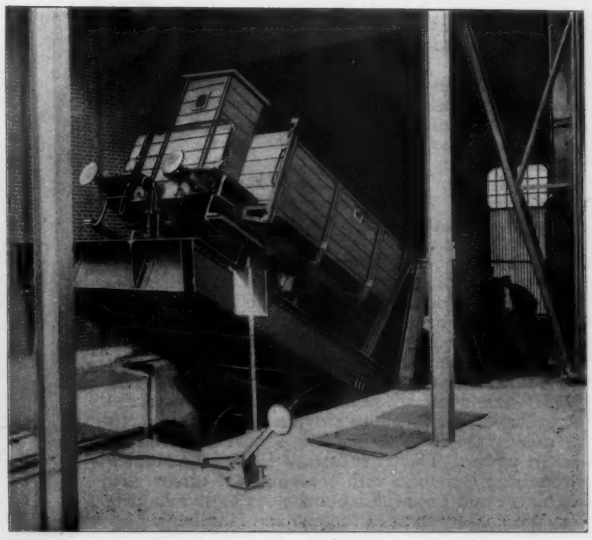


Fig. 8.—Railway Waggon Tip at the Nuremberg Gas-Works.

"Bamag" implies, one of the specialities of the Berlin Anhalt Engineering Company, and will be recalled by those engineers who attended the meeting of the German Association in 1907, at Mannheim, where there is an extensive installation of it. The section concludes with illustrations and descriptions of coke breaking and sorting plant, as well as arrangements for loading the prepared coke into railway waggons and grids. An example of an electric suspension railway for conveying coke and of the loading plant used in conjunction with it which appears in the album has recently been given in the "JOURNAL" in the description of the works at Amsterdam (Vol. XCI., p. 232).

The sixth section refers to stoking machinery. It opens with descriptions of various machine chargers—some of the semi-manual type. Then follow illustrations of a number of installations of the De Brouwer charging machine. Of interest is the

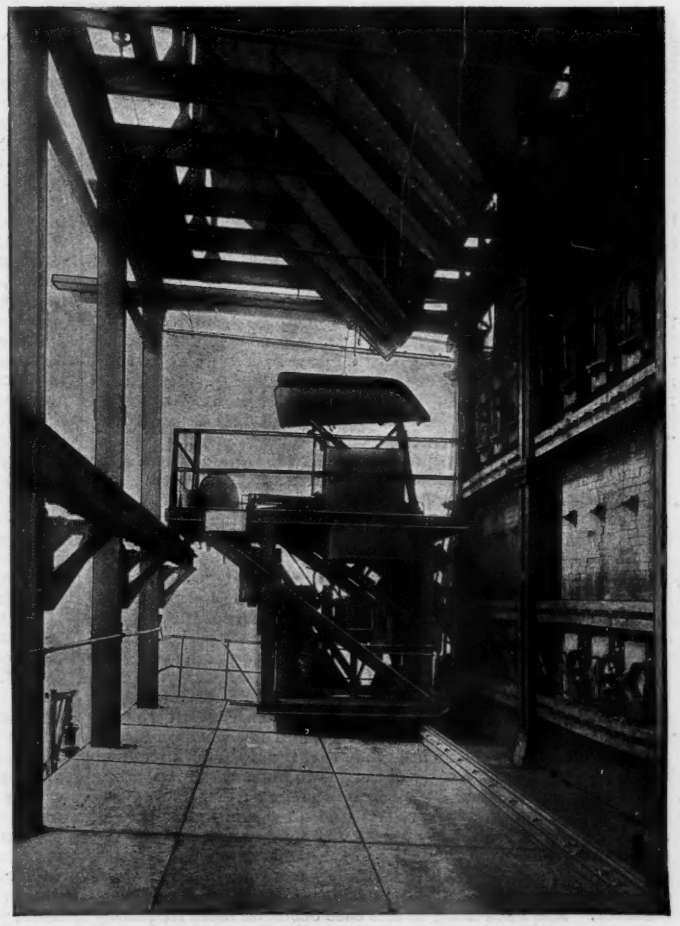


Fig. 9.—Charging Machine and Door-Lifting Machine for the Munich Chambers.

charging and discharging machinery used in conjunction with the Munich carbonizing chambers. This is shown in fig. 9. The machine is provided with a tilting funnel or trough, arranged so that it can be brought into a proper position for delivering the coal from the outlets of the coal bunkers into the charging mouthpieces of the chambers. The coke is expelled from the chambers by means of a pusher attached to a toothed bar actuated by means of a spur-wheel and electric motor. The discharging machine really only serves to set in motion the slab of coke in the chamber, so that it may fall out by gravitation at the opposite side of the chamber. Frequently the coke rushes out, owing to the inclination of the base of the chambers, as soon as the door on the discharging side is opened; but the discharging machine is necessary in case the fall does not take place automatically. The next illustration, fig. 10, shows the machine used for lifting the doors of the Munich carbonizing chambers on the discharging side. These doors are necessarily very massive; and it is, therefore, requisite to provide mechanical means for raising them. The machine shown is driven by electric power. There are installations of the Munich carbonizing chambers with charging and discharging machinery and door-raising machines at the Leipzig Gas-Works, as well as at Munich and Hamburg.

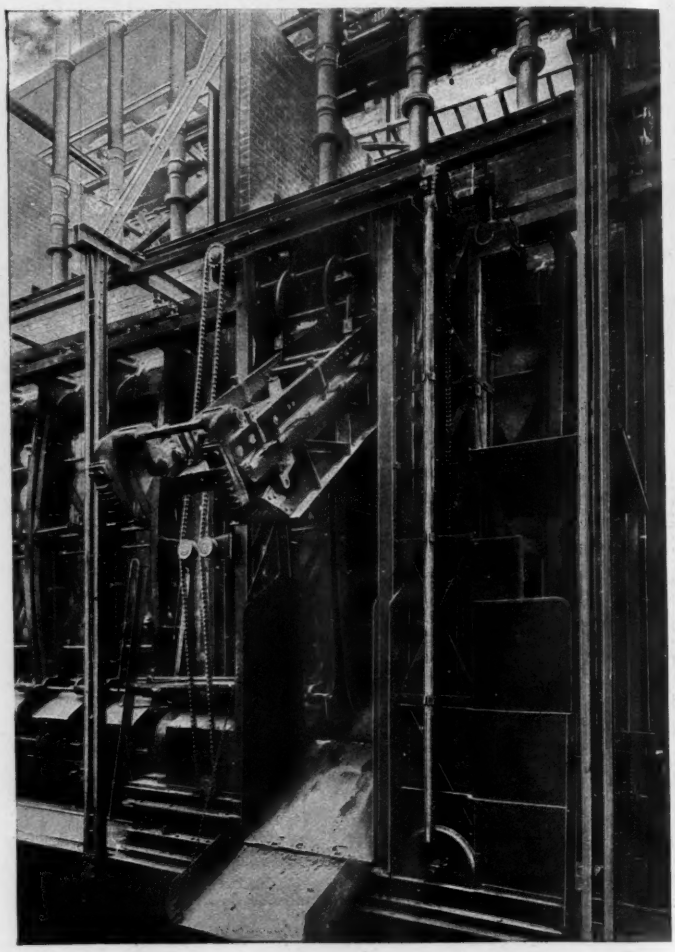


Fig. 10.—The Discharging Side of the Munich Chambers.

TROUBLES OF SUCTION GAS USERS.

[COMMUNICATED.]

IT is often noticed that while makers of suction-gas plant are, perhaps very naturally, never tired of proclaiming the virtues and economies of their installations, the users often find themselves in difficulties, with results that are frequently serious in character. The makers are too fond of stating that any unskilled labourer or handyman is competent to take charge of the plant. To judge from the number and variety of the complaints which may be heard and read about on all sides, this statement is not only absolutely untrue, but is also contributory to the serious mishaps so often experienced.

The writer was interested to notice the variety of difficulties experienced by different users of producer plants, and about which questions were asked in an engineering contemporary. In one case a large four-cylinder vertical gas-engine, of 100 B.H.P., was the cause of trouble owing to "back-firing." The engine was in good order, and it was found that "back-fires rarely took place when on town's gas; but when on either of two suction plants, they were of fairly frequent occurrence, particularly if the mixture was not quite right." Several replies were received from correspondents. One suggested that the mixture was most probably to blame, in which case it would be advisable to introduce less steam, as the proportions of oxygen and carbonic oxide or hydrogen were evidently forming a mixture which would explode at low temperatures. Another suggests the very reverse as the possible cause, in the words that "a weak mixture will burn slowly, even right through the exhaust stroke, and fire the incoming charge." The same person mentions that a dirty scrubber or purifier might be the cause, through dust being carried over with the gas and remaining incandescent long enough to fire the charge. The same correspondent summarizes by stating that the probable cause is either too rich or else too weak a mixture. He further adds that "town's gas is practically constant in its composition, while suction-plant gas varies within somewhat wide limits from time to time; the limits depending on the attention given to the fire and water. So that once the right mixture is set for town's gas, no further attention is necessary, but with suction gas the air supply requires alteration from time to time—this with a constant or fairly constant load."

Correspondent No. 3 endorses the previous suggestions, and, like the last, pays town's gas a well-deserved compliment, stating that "the conditions prevailing at the gas-cock do not vary greatly from one week to another with town's gas; whereas with a suction plant there are bends and passages getting made-up, the scrubber coke getting dirty, the fire accumulating ashes, or a varying load is altering the heat of the fire, &c., all of which alter the conditions at the gas-cock. The above may explain somewhat why the engine back-fires running on suction gas and not when on town's gas." Further suggestions are made that the brickwork may not be airtight, and so allow some of the gas to burn at the top of the generator; that the fuel bed may be too deep; that the steam-raiser may be sealed up and so produce an insufficient supply of steam. The fourth would-be helper was positive that he knew the cause of the trouble, for he had had the same experience himself, and had eventually found it to be due to a deposit of unconsumed carbon from the gas on the interior walls of the combustion chamber. The back-firing in this case occurred more frequently on producer gas than on town's gas. The remedies consisted of checking the circulating water, especially when starting and shutting down. This "remedy" was directly opposed to one that was suggested by an earlier correspondent, who states that the circulating water must be kept below 110° Fahr. with producer gas to avoid pre-ignition.

No. 4, like his predecessors, evidently thinks well of town's gas, for he mentions a further point that "producer gas contains a greater percentage of carbon (free and combined), also carbon-producing impurities, such as tar." To this cause is due the deposition of carbon in the cylinder. Curiously enough, or not as the case may be, three of the four whose solutions are given each mention a difficulty of their own, and seemingly of a very puzzling nature, and not at all of the sort to be overcome by an "unskilled labourer." All this points to the fact that suction gas is of a widely-varying quality, both in the percentage of its constituents and the nature of its impurities; and it will be noticed that in each case the trouble was diagnosed as being due to one or both of these causes. In each case town's gas received commendation as being superior, and as giving less cause for trouble.

It will be noticed that the various solutions put forward by the four users of suction plants were in several cases direct contradictions. The thoughts of the questioner on reading these replies may be better imagined than described. It is not at all surprising that difficulties—and difficulties, too, of a very complex sort—are experienced when working one of these plants. They are presumably of a similar type to our carburetted water-gas plants, though possibly more compact in construction. Being of a smaller size certainly does not prevent them giving quite as much trouble and requiring just as much experienced attention. In contradistinction to the claims of the suction plant maker, that any "unskilled labourer" is competent to take charge of one of their plants, it is noticed that, writing on "Gas Power Topics," Mr. W. A. Tookey discusses the "importance of knowledge" to those in charge of gas-power installations. Here he mentions the fact that the "reliability of the gas-engine is directly affected by the amount of knowledge possessed by the attendant. In the absence of such knowledge, trouble soon follows." In one case he mentions that a gas-engine was found to run well on town's gas, or with producer gas enriched by town's gas; but as soon as it was turned on to producer gas alone, it would pull up. The problem was not solved until an independent adviser was called in, who proved that the trouble was solely due to a dirty fire. In another case, two engines were fed from the same suction producer; and it was found that while one engine would run by itself, yet when the second was started neither would run properly. Eventually the trouble became such a real one that a steam-engine and boiler were installed for the sole purpose of keeping the shafting revolving till the gas-engines, being driven

at their normal speed by the main shafting, began to draw each its gas simultaneously. Then they would consent to work together without any further trouble.

These few cases undoubtedly show that a good deal of trouble is experienced with suction-gas plants; and while there may be a saving where town's gas is expensive, yet any economy resulting from its use may be very easily wiped out when machinery, and sometimes a whole factory, is kept idle for a number of hours, or even days. No manufacturer cares to risk a curtailment of his output, and it is undoubtedly true that many have been introduced on the representations of the maker that the plant needs no skilled labour. The figures upon which the advertisements are based are "test" ones where experienced men, both practically and theoretically, are present to make the small changes and alterations which mean so much in any gas plant. In the case of suction-driven gas-engines generating electricity, it is sometimes found that it is practically impossible to prevent slight gas leakage taking place at the various glands. This gas is drawn into the dynamo windings and over the commutator, blackening the copper surface, and so impairing the commutation of the machine. The cases and causes of trouble experienced with these plants are innumerable; and it is quite certain that, had gas companies early resisted the competition in an energetic manner, many of the plants would never have been built.

WOOD AND CHARCOAL GAS.

An Australian Invention.

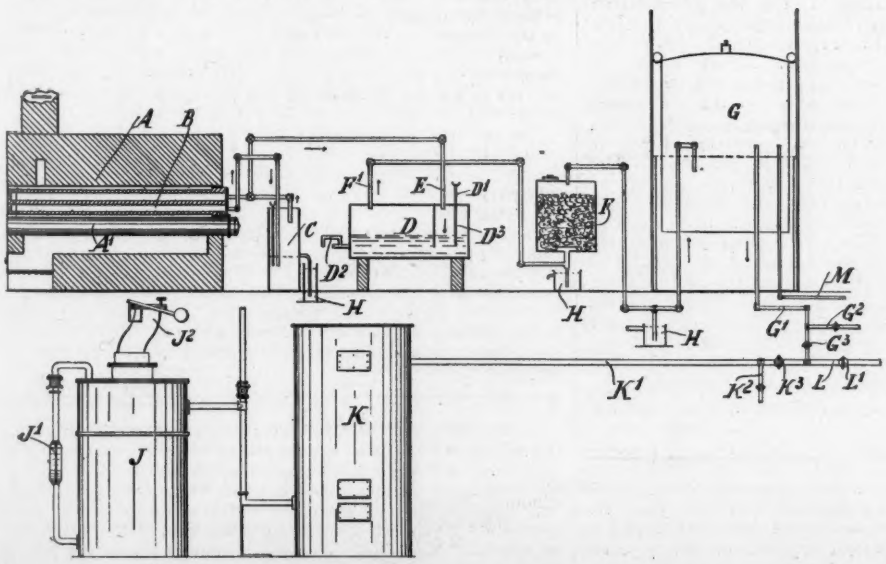
REFERENCE was made in the report of a lecture delivered by Mr. Matt. Dunn, the Assistant Manager of the Stockton-on-Tees Gas-Works, in December last (see "JOURNAL," Vol. CIV., p. 826) to a demonstration of wood gas and charcoal manufacture at the local works of the Power Gas Corporation, Limited. The inventor of the "Wood and Charcoal Dual Gas Producers" which were used in this demonstration, is Mr. W. B. Brooks, of Adelaide, who has placed in our hands reports by Mr. Dunn, Professor Vivian B. Lewes and others on the apparatus and the working of the process, together with illustrations of the plant. From these sources we abstract the following particulars.

The Brooks plant at the Parkfield works of the Power Gas Corporation at Stockton-on-Tees includes a direct-fired setting of two fire-clay retorts, 12 inches in diameter and 6 feet long. Each retort is of sufficient capacity for the carbonization of 1 cwt. of wood. In a projected bench with regenerative firing, the retorts will be in beds of three; and their length will be increased to 9 or 10 feet. Each retort is connected with a fire-clay superheater, into which the gas evolved passes, carrying with it the tarry vapours, which are cracked and converted into gas in traversing in series the four longitudinal passages of the superheater. The retorts and superheaters are stated to be heated to a temperature of from 1600° to 1900° Fahr. The gas passes from the superheater by a connection to a hydraulic box or main, through which it is drawn by means of an exhausting fan and forced on through a wrought-iron scrubber into a gasholder. In the plant at Stockton-on-Tees, the gasholder was of 500 cubic feet capacity, and was used to measure the quantity of gas made. From the holder the gas was delivered through a small purifier to a 10 to 11 horse power gas-engine, and was thence led to lighting burners.

The yield of gas—on the average of several carbonizing trials with oak, elm, pine, and jarrah woods, either singly or mixed—was, according to Professor Lewes, 13,000 cubic feet per ton, with a calorific value of from 375 to 390 B.Th.U. per cubic foot; and according to Mr. Dunn, 14,319 cubic feet per ton, having a calorific value of 396·43 B.Th.U. per cubic foot. But Mr. Dunn found his gas to be of lower specific gravity (0·7932) than Professor Lewes gives in his report—viz., 0·8801 for the crude, and 0·8544 for the purified (*i.e.*, carbonic acid free) gas. Professor Lewes reports the average composition of the gas in percentages by volume as: Hydrogen, 27·00; unsaturated hydrocarbons, 2·75; saturated hydrocarbons, 18·80; carbon monoxide, 21·00; carbon dioxide, 27·00; oxygen, 0·75; nitrogen, 2·70. Mr. Dunn says that the proportion of carbon dioxide varies, according to the wood used, from 16 to 25 per cent. The yield of charcoal varied from 17 to 22 per cent. (averaging 21 per cent.) of the weight of wood carbonized; but with Australian jarrah, and doubtless with some other air-dried dense woods, it would be nearer 30 per cent. The gas, when burnt in incandescent burners at a rate one-third faster than that for 16-candle coal gas, gave a lighting duty of 14 to 15 candles per cubic foot. In the gas-engine, the consumption was 24 cubic feet (Professor Lewes) or 27·7 cubic feet (Mr. Dunn) per brake-horse-power-hour. So that the gas from the carbonization of one ton of wood should yield, according to either authority, about 540 B.H.P. hours. But allowance must be made for the wood consumed in the retort-furnace, which was a high proportion with the direct-fired setting at Stockton. With an improved regenerative setting, Professor Lewes computes that it could be reduced to some 5 cwt. per ton. Thus there would be obtained about $3\frac{1}{2}$ cwt. of charcoal, and wood gas capable of yielding 432 B.H.P. hours, from one ton of wood disposed of in the plant (*i.e.*, in retorts and furnace).

A feature of the Brooks scheme is, however, the utilization of the charcoal produced in the retorts for the manufacture of producer gas, in a special charcoal gas producer—apparently of the suction type. In this plant, 1 lb. of the charcoal is assumed to be capable of producing gas equivalent to one B.H.P. hour when consumed in a gas-engine. Hence there should be obtainable through the retorts, producer, and gas-engine, $432 + 376 = 808$ B.H.P. hours for every ton of wood used up. If similar wood is burnt to raise steam in a good boiler, and the steam is applied in an engine of modern construction, about 370 B.H.P. hours only would be obtained per ton of wood, according to Professor Lewes. There is thus apparently a very great advantage in carbonizing the wood, gasifying the charcoal obtained, and using the mixed wood gas and producer gas in a gas-engine, over the older method of burning it under boilers. Even with other fuels, however, the producer and gas-engine can almost always be shown to be more economical than the boiler and steam-engine. Nevertheless, the latter combination still survives. Where, however, economy of fuel is of paramount importance—as in many inland places in Australia and South Africa—obviously the Brooks dual scheme of gas production from wood and the resultant charcoal should receive careful consideration.

There are districts where anthracite and steam coal are obtainable only at almost prohibitive prices, while rough wood is comparatively cheap. The use of wood gas with or without charcoal producer gas seems clearly indicated as proper in such districts. A higher yield of mixed gas might be reasonably anticipated from certain of the relatively dry and dense colonial woods than from the kinds generally available in England. Indeed, considerably higher figures than those quoted above are given in reports of trials of the Brooks plant made in Australia. Obviously, the gas-making process also has another advantage over steam-raising, in that the gas is directly available for lighting and for heating where temperatures superior to those that are obtainable through steam are required.



A. Furnace fitted with fire-clay retorts A^1.
B. Supplementary gas chamber.
C. Hydraulic box.
D. Washer, with inlet pipe D^1, overflow D^2, and baffle-plate D^3.
E. Inlet to Washer.
F. Scrubber, with outlet pipe F^1 from scrubber.
G. Balanced gasholder, with outlet pipe G^1, fitted with stop-cocks G^2, G^3.
H. Water-seals.
J. Gas producer, with air-injector J^1, and feeding hopper J^2.
K. Scrubber, with outlet pipe K^1, fitted with stop-cocks K^2, K^3.
L. Outlet pipe to gas-engine, fitted with stop-cock L^1.
M. Outlet pipe from wood-gas holder to gas-engine ignition tube.

Sketch of Arrangement of the Brooks' Dual Gas-Making Plant, as Patented in Australia.

MODERN METHODS OF ARTIFICIAL LIGHTING.

Mr. Leon Gaster's First Cantor Lecture.

At the Society of Arts, on Monday last week, Mr. Leon Gaster gave the first of the course of four Cantor Lectures, on "Modern Methods of Artificial Illumination," which, as announced in the "JOURNAL" for the 9th inst., he had undertaken to deliver.

The lecturer confined himself to a consideration of the various methods of lighting by electricity; and, to illustrate his remarks, he had on view a number of lamps, some of which were shown for the first time. Alluding to the modern tendency in favour of the metallic filament lamp, he said he did not believe that the carbon filament lamp had been wholly superseded, seeing that experiments had shown that, by some sacrifice of the life of the lamp, it was possible to obtain increased efficiency on a commercial basis. Great improvements had been effected lately in metallic filament lamps, resulting in a much improved illumination for the same expenditure of energy, and making it possible for the light to be employed economically under more favourable physiological conditions. This was a point that he desired to emphasize, as those associated with lighting developments were apt to pay too much attention to increased efficiency and to disregard the effect of the illuminant upon the sight.

Several improvements in arc lamps had also to be recorded; the latest development being the employment of a dioptric glass, which dispersed the light in a horizontal plane, and would, it was claimed, effect an improvement in street lighting. A question arose in connection with lamps which permitted the passage of a large percentage of ultra-violet rays, and it was doubtful whether the physiological effects of such rays had been sufficiently investigated. The Moore system of luminescent gases was an interesting development; the light being produced by a high-voltage discharge through a tube containing either nitrogen or carbon dioxide. The difficulty had been to discover and to maintain automatically the particular vacuum required to give the best results. He believed that phosphorescent methods of illumination might eventually be employed. A small quantity of radium would cause a substance to become fluorescent, and after a time to become phosphorescent for a long period.

In his second lecture, delivered last night, Mr. Gaster dealt with artificial lighting by gas. It will be noticed next week.

MR. O'CONNOR'S SECOND LECTURE.

On Monday evening last week, Mr. Henry O'Connor, Assoc. M.Inst.C.E., F.R.S.E., gave the second of the series of Keith Lectures, on "Gas Manufacture and Lighting," which he is delivering to the Royal Scottish Society of Arts, Edinburgh.

In treating of the engineering required in the design of modern gas-works, the lecturer referred to the choice of site, so that material could be brought to, or carried away from, the works; also to the subsoil, as heavy buildings had, he said, to be placed upon it and the foundations secured. He described the course of the gas from the retort to the holder. The unloading of coals, which are brought to some large gas-works by spacious colliers, unloaded at piers by hydraulic cranes and automatic grabs, and transported to the stores by huge structures or carried by means of conveyors, of which various types were described, or by locomotives and trucks, was fully explained. One gas-works was referred to where 50 locomotives and some 60 miles of railway are in use. The machinery for charging retorts, from the simple hand apparatus of West and Biggs-Wall to the power-driven machines of the former and the hydraulic apparatus of the late Mr. Foulis and Sir William Arrol, and the electrically driven projectors of De Brouwer, was all described. Retorts set at the angle of repose of the coal and also at 45 degrees, when the retort can be completely filled, vertical retorts of two different types, which save floor space and give high results, and coke-ovens, were all discussed; it being indicated that the two latter systems are probably those which will be adopted in the future. The mechanical removal of coke from the retort-house, and its disposal about the yard, by the De Brouwer, West, and Temperley systems, and the breaking of the coke to such a size as to make it convenient for popular use, was shown. The process of purifying the gas and the apparatus employed were next dealt with. The lecturer concluded by referring to the large meters used for measuring the gas in bulk, and to the holder in which it is stored. He pointed out that in the latter the engineer's knowledge is most required, as the stresses are more complex than in almost any other engineering structure. The ordinary type of holder and the modern columnless systems of guiding were both described.

The lecture was illustrated by a large number of excellent lantern slides.

At the annual meeting of the Sunderland and South Shields Water Company last Thursday, the Secretary (Mr. John W. Sutherland) was presented with an elegant silver salver and a cheque for fifty guineas, to mark the completion of his fifty years' service with the Company.

STUDENTS' VISIT TO EAST GREENWICH.

A small party of students of the Institution of Civil Engineers last Wednesday afternoon paid a visit to the East Greenwich works of the South Metropolitan Gas Company, where they were able to see and hear a great deal that must be of value to them. The visitors were received by Mr. J. Tysoe, the Engineer of the works, who, with his Assistant, Mr. J. White, showed them round. They could not have been in better hands; for both these gentlemen have been at East Greenwich since the start of the works, some twenty years and more ago. In addition to a printed description of what was to be seen which was circulated among the party, the different processes were carefully explained by the indefatigable guides, who spared no pains to make everything as clear as possible to the students, who were, of course, not drawn from gas-works staffs.

It is hard to say which part of the works proved most attractive to the visitors, who displayed a keen interest in all they saw and were told. For the sake of convenience, a start was made at the holders and the fan and governor house, where the arrangements for increasing the pressure of the gas were examined, and attention was, of course, directed to the huge 12 million cubic feet six-lift holder. At the chemical works there was seen the plant for the manufacture of sulphate of ammonia and the necessary sulphuric acid. Four units of acid plant have been erected, which deal with 18 tons of spent oxide per day. The make of sulphuric acid is about 16,000 tons a year, as this is all that is required. The plant is, however, capable of turning out 20,000 tons per annum. As to the sulphate of ammonia plant, it may be remarked that East Greenwich deals with the liquor from all the Company's stations except Old Kent Road, where sulphate making is also carried on with sulphuric acid provided by the plant at East Greenwich. In connection with the shipment of the sulphate, a little installation was seen which was the object of a good deal of attention. The arrangement, which was devised by Mr. Carpenter, is a simple and expeditious one. When the sulphate leaves the store, it falls into a hopper, from which it is as required allowed to pass into bags, which are caused to rest on a weighing machine and are sewn up as soon as filled. The bags (which hold from 1¾ to 2 cwt. each) are then laid on a conveyor that takes them out of the building and away to the riverside, where they drop down a shoot on to the waiting barge below; the number being mechanically registered as they pass along. During the visit to the chemical works, much most valuable information was imparted to the students by the Superintendent of the acid plant, Mr. F. Shadbolt.

Naturally, a good deal of time was spent in the retort-houses, where the Arrol-Foulis hydraulic and the West wire-rope machines were seen in operation. There have also, it may be remarked, been fitted up at this station several of the "Co-Partner" discharging machines (the joint invention of Messrs. Hunter and Barnett), which were evolved at the Rotherhithe works; and they are found to work very well. When passing to the machine shops, a space on the front of the clock-tower at the office buildings was noticed to be covered up; and on inquiry it was learnt that a bronze tablet to the memory of Sir George Livesey (subscribed for by the officers and men engaged on the works) had been fixed there, and that it was to be formally unveiled in the course of a day or two. There is an extensive array of machine tools of all kinds to be found in the workshops; but perhaps the portion that excited most wonder in the minds of the party was the size of the carpenters' shop, where, in addition to power saws, &c., there was seen in operation a machine which planes the two sides and two edges of a board at one and the same time. It may safely be said that the extent of this particular shop was a revelation to most of those present, and it impressed upon them the magnitude of the operations carried on by the Company. As Mr. Tysoe remarked, it was impossible for visitors to go away from East Greenwich with the idea (in the possession of which some people entered the works) that the production of gas for illuminating and heating purposes began and ended with the distillation of the coal in the retorts.

The last part of the works visited was the coal unloading jetty, with its fixed hydraulic and travelling cranes and Hone grabs, for discharging the coal from the ships into continuous hoppers. At this jetty ships of up to 4000 tons can be dealt with—in fact, the party saw a 2000 ton vessel there, which had carried coal from Newcastle. Tea with Mr. Tysoe brought to a conclusion what had proved (in accordance with anticipations) an instructive and pleasurable afternoon. Both these aspects of the visit were emphasized by the proposer of a cordial vote of thanks to Mr. Tysoe, who, in reply, laid special stress upon the great educational value to engineering students of visits of this character to works where large industrial operations of general interest were being carried on.

According to the United States Consul-General at Rotterdam, the old-fashioned Dutch windmills are being superseded by gas-engines. Windmills are principally used in Holland for the purpose of pumping water out of drain ditches, which must be done regularly, in order to keep the fields and meadows dry (the greater part of the Netherlands lying below the level of the sea); and it appears that wind is too uncertain a motive power for this particular purpose.

CONSTRUCTION AND ERECTION OF A ONE-AND-A-HALF MILLION THREE-LIFT GASHOLDER AND CONCRETE TANK AT DEVONPORT.

By J. M. Campbell, of Luton.

[Abstract of a Paper Read before the London and Southern District Junior Gas Association, Jan. 29.]

The facts that in the past there has been rather a dearth of papers of a direct engineering character read before your Association, and that (in my capacity of Resident Engineer) I was very closely identified with the erection of the 1½ million cubic feet gasholder and concrete tank at the Devonport Corporation Gas-Works, have doubly constrained me to accept the invitation to give a paper before you this session.

Gasholders are one of the most costly items on a gas-works; and many a gas manager has, owing either to the financial condition of the undertaking he controls or for other reasons, to continue working winter after winter with nothing approaching a storage equivalent to his maximum day's make. In these days, where (perhaps) there are insufficient local demands for coke or poor prices are obtainable for it, this need for increased storage, in order to meet sudden demands or to assist in more economical working, is oftentimes met by installing the "made-while-you-wait" water gas, either straight or carburetted. It is not given to every junior therefore to be in the service of a gas undertaking at the precise period when an extension of storage accommodation in the shape of a gasholder is carried out. Hence this paper may prove of value to many of my audience; and since the gasholder and tank under notice possess several novel features, I hope I may be able to describe some things which may be of interest and benefit to all present.

The history of the several steps leading up to the transfer of the Gas Company's undertaking to the Corporation of Devonport is not of real interest in connection with the subject of this paper; but it is quite sufficient to say that at the time of the transfer the total capacity of the three gasholders was 860,000 cubic feet, while the largest daily make merged on 1¼ million cubic feet. The Consulting Engineers (Messrs. Stevenson and Burstal) recommended, along with other more important extensions, that a telescopic gasholder of 1½ million cubic feet be erected. This was approved of by the Committee, and subsequently ratified by the Council. The necessary drawings, specifications, and bills of quantities were prepared; and the contracts for the concrete tank and for the three-lift gasholder with guide-framing were duly let.

The site of the new gasholder and tank is some ¾ mile from the gas-works, and is connected therewith by 24-inch inlet and 30-inch outlet cast-iron mains, the supply and the laying of which formed separate contracts to those of the gasholder and tank. There were twelve trial holes sunk over the area of the site of the tank; and a record was kept of the nature of the strata penetrated, which was noted on the contract drawings. It was found that at distances varying from 3 ft. 6 in. to 7 ft. 6 in. from the natural surface of the ground, Shillet rock of a fairly hard character was to be met with. This rock is of a nature which, I believe, is not to be met with anywhere else except in the Welsh slate districts and in certain parts of Devon and Cornwall. It is a species of slate; and underlying the upper drift surface what is generally met with is a broken slatey shale in very small pieces, and often mixed with yellow clay. This is so small and loose that it can be drawn out with the fingers, and lies in quite its regular laminations, though at varying angles to the horizon. Sometimes it is found perpendicular, and within a few yards it may be seen horizontal, and again quite close it may lie at an angle of (say) 45° either way, while one remarkable peculiarity is that the grain always runs from east to west. Further down from the surface this Shillet becomes much harder, and of a decidedly closer grain, with thicker laminations; while still lower at a certain varying depth it becomes so very hard, with no perceptible grain or laminæ, and bearing an appearance akin to cannel, that for its excavation recourse has often to be had to blasting—a pick merely flying off. Pockets are frequently met with where large slips of this Shillet occur during excavation, leaving only the hollow places, when it will be seen that the surfaces of those hollows are thickly coated with a blueish greasiness, which gives rise to the local term of "greasy back" in this connection.

Construction of the Tank.

The tank, which is 150 feet in diameter, is situated on a long strip of ground alongside a main road, measuring about 250 feet wide; and as the tank was constructed 132 feet from this road to its centre, and 108 feet from the end boundary, it will be seen that a good space has been left all round the outside of the coping. The site is enclosed by a 6 feet wrought-iron unclimbable fencing, with a large double gate and small wicket gate from the road. The space around the outside of the tank was arranged to be grassed down when the work was completed, so the contractors wheeled the vegetable top soil (from over the area to be occupied by the tank), and tipped it in a heap conveniently situated for its future spreading over the banks around the tank.

After the centre of the tank had been definitely set out, it was effectively maintained throughout the job by the insertion in the ground of a 7 or 8 feet piece of scaffold pole some 4 inches or so in diameter, which was first driven in and then roughly (though rigidly) concreted in its correct position and truly upright. This centre-post was surmounted with a flat disc having a ¼ inch diameter pin with screw end and nut securely welded on to it, and which was screwed down on the end of the post permanently in the dead-centre. A staging was erected around the top of this post, to carry the theodolite, &c. The object of this short centre-pin will be, to most of you, obviously for the purpose of measuring the several radii of the tank walls, piers, &c.; but I will refer to this matter at greater length later on.

The tank is 150 ft. 1½ in. from face to face of the concrete walling, and 33 feet from the top of the coping to the top of the landing-stones; but this depth does not give that excavated, owing to the surface-levels being very irregular. and the tank-walling standing above the natural surface levels. Owing also to the line of rock being met with at varying depths around the circumference, it follows that the excavation in the rock was variable; and, since the solidity of the rock depends in great measure on the depth down, it will be gathered that on the north side the excavation was the hardest met with in the circle. It was consequently necessary to have some fixed datum to work from for all vertical levels; so I had a post firmly driven in adjoining the north side of the tank, where, on account of its being the highest ground, it was not likely to be disturbed by the operations of the tank construction, nor was it liable to be buried, since there was no filling-in required there. The top of this post was 50 feet above Ordnance datum, which corresponded with the level of the finished top of the coping of the tank.

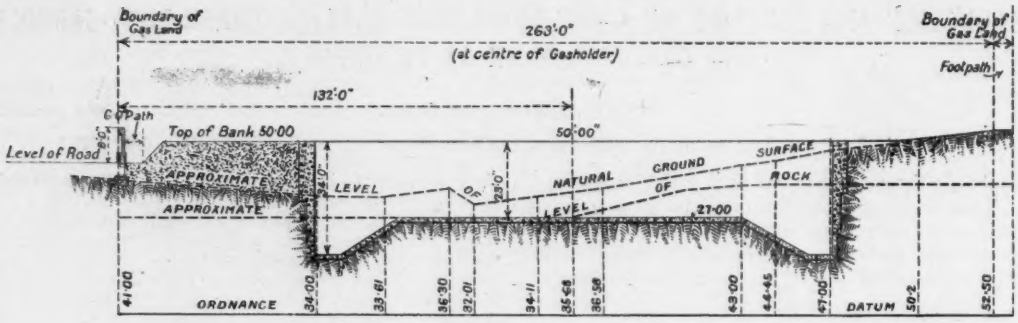
After having set out the tank-centre, and fixed these posts for both the horizontal and vertical measurements, and the top mould being removed, the next thing was to excavate the circular annular trench in which to construct the walling. The thickness of the tank-wall is not any greater than 2 feet below the level at which the Shillet rock is met; and from a level of 26 feet from the top of the coping right to the bottom there is only 1 foot thickness of concrete walling. This is, of course, entirely opposed to the usual practice, and may seem like building the tank upside down; but as the rock at the lower levels was of such a consolidated nature, all that was really needed was to face the excavation with concrete to provide a means of attachment for the cement rendering in order to effect water-tightness. To all intents and purposes, such a tank is a natural one—there being no external forces tending to crush the walling (if the "lie" and nature of the strata be satisfactory), and its stability and solidity cannot be bettered, always provided, of course, that the rock is sufficiently hard to withstand any lateral inside pressures, subsequently to be applied.

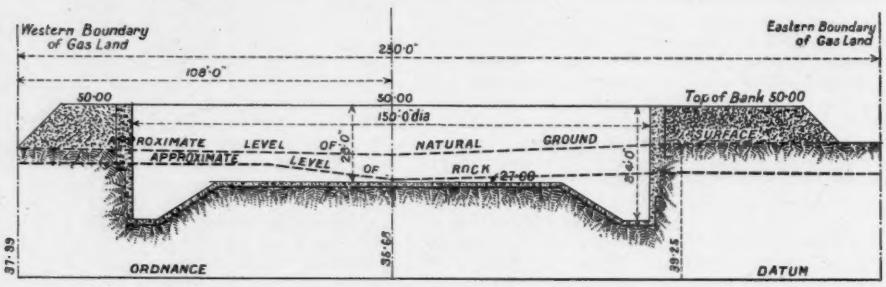
The annular trench was sunk 5 feet wide clear of the face of the walling, with a recess at the lowest part of the circle to act as a sump outside the tank wall. Owing to the already described peculiarities of the strata, the trench had to be timbered and strutted all round, and especially strong on the north side, where the push of rising ground behind was exerting a considerable pressure on the outside; and (as the direction of the Shillet was rather unsatisfactory here) it necessitated the walling being constructed thicker around this portion of the tank.

The contractors laid down a railway-track around the part circumference on which a steam-crane with swinging jib travelled; and branching off at convenient points were other similar lines on which tipping bogies ran carrying the excavated material, which was used for filling-up all round the tank and beyond, and for raising the surface-level from 5 feet to 17 feet above the natural level of the ground. As the banking became higher, these rails were raised correspondingly. The travelling crane was assisted in the removal of the *débris* (and the subsequent lowering of the concrete) by first one, and then two, stationary derrick steam-cranes, so that the entire circle of the annular trench was compassed.

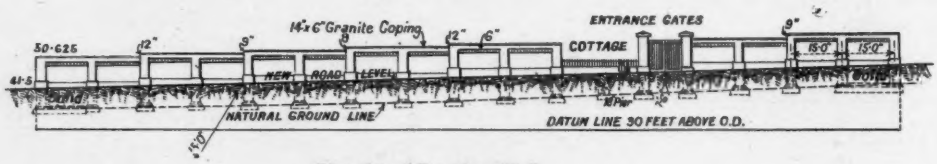
The concrete used for the tank throughout was composed entirely of local broken granite, local mine (or river) sand, and best portland cement. The concrete was supplied through a "Gravity" mixer into tipping-skips on bogies, running on rails laid from inside the tank across the annular trench by a bridge to the rail-track around the circumference on which the travelling crane ran. It was here picked up, then lowered, and tipped in place; and the concrete was turned over and spread into position as required, then rammed. It cannot be too strongly emphasized that concrete, to be homogeneous and consistent throughout, ought never to be shot from a height after being mixed, but should be always lowered and emptied where required or else mixed *in situ*, thus avoiding any disintegration or disunion of the component parts of the concrete.

The portion of the tank first laid was that forming the bottom of the wall proper, together with some 1 ft. 6 in. or so of the floor, the outer edges of which were left ragged and rough for eventually joining up with the remaining part of the floor. As there was a considerable quantity of water at the bottom of the excavation, this concreting was commenced at the point farthest away from the pump, to which a slight fall was allowed on the bottom

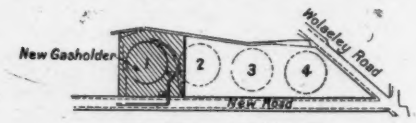




Sections of Tank.



Elevation of Boundary Wall.



Block Plan of Holder Site.

for draining. By commencing to concrete at the highest point of the bottom, all the water was driven forward to the sump-hole as the concreting proceeded, and (on account of the wet condition of this bottom) the concrete was gauged somewhat fatter and finer—fatter to neutralize the loss of cement which might result from being tipped into water, and finer to permit of its being rammed closer and avoid porosity. It is pleasing to record that in no place was there a sign of leakage through any of this lot of concrete first laid, and in water.

The bottom tier of guide-rail fixing stones is on the very bottom level; and in all cases the guide stones are set in pockets of cement, thus avoiding any possible percolation of water along by the sides of the stones either into or from the tank—they being by this arrangement covered over with cement. When it is borne in mind that the tank-walling was to be rendered in cement all over the face, it will be seen that this provision, in connection with the stones, causes the entire concrete face (on the inner side) to be treated to prevent leakage. This portion of the bottom floor being laid, the concrete where these bottom guide-stones were situated was plastered over with ¾-inch of 1 and 1 cement and sand (leaving a projecting ragged portion for the future junction of the bottom floor rendering); and while it was still "green," the stone was set in place definitely, and later on was rendered over its sides, top, and back to form the cement pocket, and then scored over with a pointed stick to provide a key for the concrete of the wall to be subsequently laid. The several radii of the tank walls, stones, piers, &c., were all set out with a steel tape looped over the centre post pin, and laid along a 6 in. by 1 in. batten with 2 inch deep sides, carried on levelled trestles standing on the ground inside the tank.

The concrete walling proper was constructed within curved wooden shields 3 feet deep and 11 ft. 9 in. long, rigidly strutted up in place from the inside of the annular trench, and also propped up (inside the shields, at the top) from the outer ring of the trench. Measurements were taken at intervals (when the shields were fixed in place) between same and the outer excavation; and any necessary trimming was then done to give the required thickness of concrete at all points. The thickness averaged out rather more than was shown on the drawing, owing to the extreme difficulty of trimming the hard rock to anything approaching a nicety. The hollows where the greasy backs had slipped away were concreted in solid, and after the concrete had been lowered, and emptied into the shields, it was spread out, and worked with the point of the shovel into the sides of the trench, and hard up against the shields.

The first height of walling was 3 feet, but all subsequent lifts were 2 feet or so; the remaining depth of 1 foot of shield being utilized to strut against the walling last constructed, and so keep the vertical line truly upright. The concrete remained in the shields for 24 to 48 hours, dependent on its situation (wet or dry) and the prevailing atmospheric conditions; and, as the shields were removed, the trench was strutted up from the concrete wall instead of from the excavated sides, poling boards being used to take, and distribute, the pressure, and to prevent damage to the newly-built wall. The top of the concrete was not prepared in any special way to receive the next lift, beyond being merely swept and plentifully watered. The watering was done just prior to the laying of the next batch of fresh concrete to effect satisfactory and complete union of the old with the new. It was found that, generally speaking, there was this complete union, and on none of the seams were there difficulties with leakages. The construction of the walls above the natural ground surface was done between the inside shields already spoken of, and similarly made outer ones with batter on face. As, of course, neither the inner nor the outer shields could be strutted against any natural face, uprights of 5 in. by 5 in. timber were erected perfectly vertical inside the tank walling for this purpose. The outer shields and these uprights were themselves very strongly strutted back into the ground, so as to take the thrust of the concrete when constructing the wall and ramming it.

The 34 feet height of walling was constructed in 16 lifts, which varied in their heights by reason of the interbuilding of the guide-rail stones, flat steel hoop bands, and the holding-down bolts and plates; these being built in as they were reached. The bottom tier of guide-stones measured 2 ft. by 18 in. by 12 in. deep, and the two intermediate tiers 2 ft. by 18 in. by 9 in. deep; and all were dressed on each face. They each had two holes, 7 inches deep, sunk on their front face and midway in their depth, to take the 1-inch Lewis bolts fixing the guide-rails, and had also a flat sunk on this surface, 18 in. by 6 in. by ¼ in. deep, with small hollows, to receive the wing plates, and the rivet heads, on the guide-rails. By these provisions, the guide-rails were enabled to be placed hard against the walling throughout their entire length, with no hollows behind them anywhere.

There were eight steel bands, each forming a continuous ring, being butt-jointed at their junctions and riveted together with ¾-inch rivets, 3-inch pitch, through double cover straps, each of the same width as the bands by ⅜ inch thick and 3 feet long. These hoops were built in the walls 18 inches back from the finished face of the tank, and at intervals of 3 feet from the top of the tank

downwards, the lowest one being 24 feet down. The two bottom bands were of 4½ in. by ½ in., the next two 4 in. by ½ in., then two of 3½ in. by ½ in., and the upper two 3 in. by ½ in. flat steel; and each was, as already stated, laid on top of the walling at the proper level, then riveted up, and embedded in the concrete. The holding-down bolts built in the piers to take the standards were each 15 ft. 6 in. long and 2½ inches in diameter, with a square head on the bottom, and having a screwed end with a hexagonal nut and ½ inch washer at the top. There were four holding-down bolts to each pier; and they were inserted in the concrete at a depth from the top of 14 feet, thus leaving 18 inches to project above the coping to take the standard bases. They were secured in the concrete with holding-down plates of 7 in. by ¾ in. flat steel, four to each pier in the form of a continuous square. The bolts were set in position (to template) at 8 inches from the finished face of the tank to the centre of the innermost two, and then 2 ft. 9 in. centres radially, and 2 ft. 3 in. circumferentially. After being thus set in place, plumbed, and concreted at the bottom, they were kept relatively correct by laying a wood template over the bolt ends at the top, and resting on the nuts. Framing was also spiked, to the boarding at the top of the annular trench, all round the bolts, to maintain their correct distance from the tank face.

To allow of any adjustment that might be required later in the position of the standards, by reason of any slight inaccuracies in the tank measurements, a 3¾-inch square core-hole was left through the concrete, around the 2½-inch diameter holding-down bolts throughout their entire length. This was also continued through the uppermost guide-rail stone, and the top base stone on the piers. The core-holes were subsequently completely filled in with strong cement grout, after the standard bases had been placed definitely in position.

The tank walling was constructed 2 feet thick at the top; and it had a 12-inch batter to a varying level corresponding with 18 inches below the level at which rock was met with, where it was 3 feet thick. It was here reduced to 2 feet, and was so continued to an all-round level of 26 feet below the top of the coping, at which point it was further reduced to 1 foot, and so continued to the very bottom, for reasons already explained. The piers were 20 in number, and measured 4 ft. 6 in. long from the face of the tank, and 3 ft. 6 in. wide, which dimensions were carried down uniformly to the 26 feet level in every case. All places, in the bottom 12-inch thick walling, where the excavation showed itself to be unsafe by reason of looseness or unstability of the strata, or where water was percolating through, were constructed with an extra thickness of 12 inches of concrete; and all pockets, irregularities, raggednesses of trimming, or fringes of the laminæ cut through, were thoroughly and completely filled in throughout with concrete well worked in to the natural face, so that no hollows were left behind the walling anywhere.

The division-wall between the tank proper and the dry well is at its centre 3 ft. 6 in. thick for its entire depth of 34 feet. The dry well (which contains the vertical legs of the 24-inch inlet and the 30-inch outlet pipes) is elliptical in shape on plan, and measures at its centre 13 feet long by 10 feet wide, and is 34 feet deep—level with the bottom floor of the tank inside. The walling on the outside of the well is 18 inches thick at the top, and has a batter of 12 in. to 1 ft. 6 in. below the line of rock (similarly to the main walls of the tank), where it is 2 ft. 6 in. thick. This thickness is continued to the 26-feet level already referred to, where the walling was to be 1 foot thick; but local conditions made it necessary to have the 2 ft. 6 in. walling continued lower, and 2 feet thick walling instead of 12 inches in the lower levels. The inlet and outlet pipes come through from the dry well into the tank proper below the level of the bottom floor of the latter, so a grippe, 4 feet deep and 9 feet wide, was cut out to take same in the required position; and after concreting the bottom and sides of this grippe and under the division-wall, the two short lengths of piping were accurately set in position to project on each side sufficiently to make the joints eventually, after which the walling was constructed. These pipes being put in first and built in with the walls, no difficulty was experienced later with water percolating through, or in making good to the walling, as has sometimes been experienced.

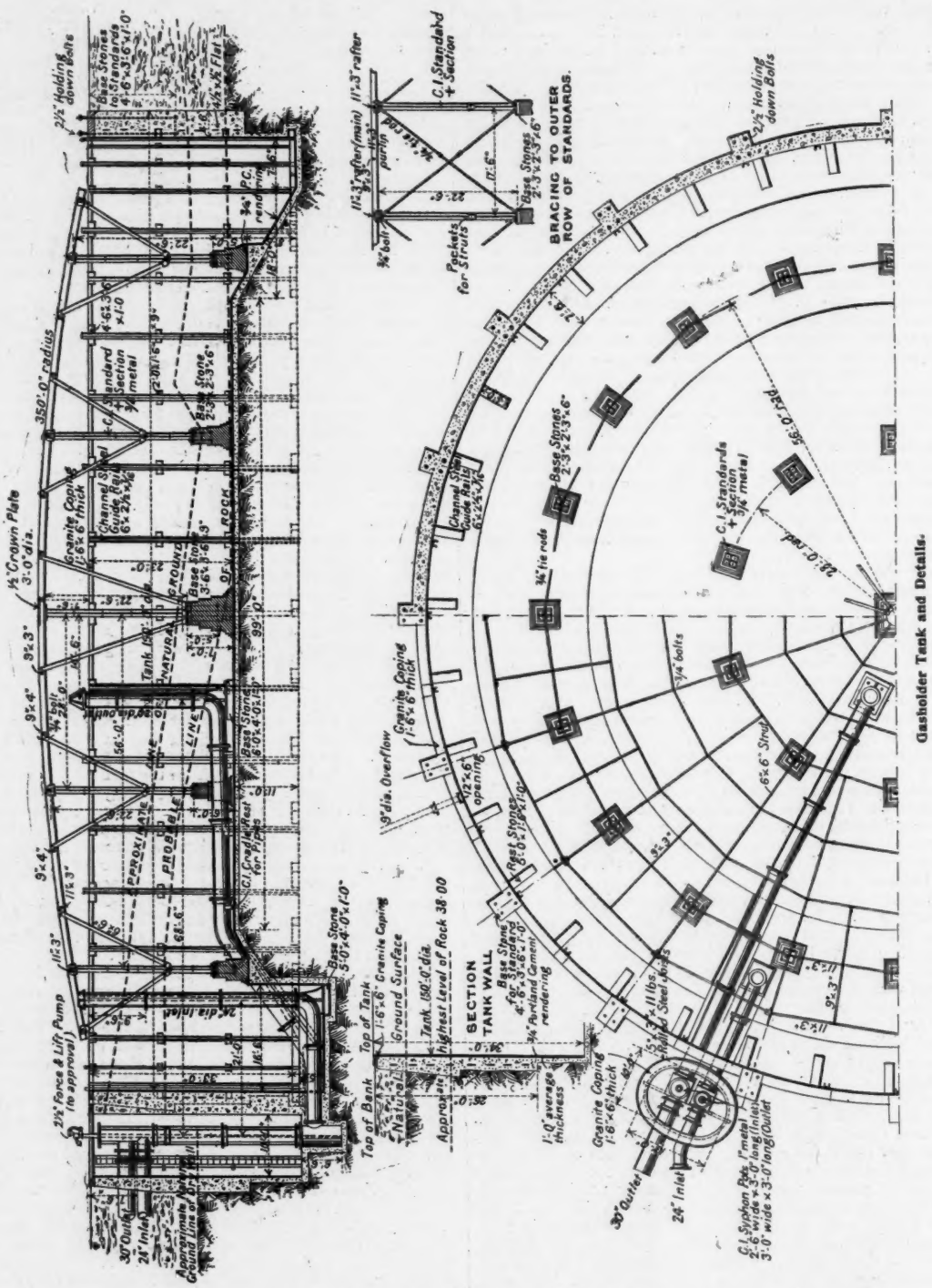
The dry well walling was constructed with two half-elliptical shields which completed the entire circumference. These were strutted up from each other; and the concrete was lowered and tipped into them. The inlet and outlet syphon-pots were set and embedded in concrete, after jointing up with the projecting ends of the pipes laid through the walls; and, as the tops of these pots were just above the level of the bottom floor, rain and other water finding its way through the excavation was lifted by a hand-pump into them, and thus conveyed into the annular trench inside through the open-ended pipes, and so by a trough to the tank floor, and on to the steam-pump, keeping the excavations clear of water. A wrought-iron ladder extended from the top to the bottom of the dry well.

The top of the tank-wall, and also that of the dry well, was surmounted with dressed local granite coping 1 ft. 6 in. wide and 6 inches thick, all curved to the required radii. On the southern side, a special cast-iron overflow was built in, with the lip 3 inches below the coping level. This overflow was coupled by 9 in. and 12 in. piping to the storm-water culvert in the main road. The coping to the dry well had a rebate cut on its inner face 3 in. wide and 2½ in. deep to receive the cover, which was in six segments and constructed of ¼-inch chequered steel plates with 2 in. by 2 in. by ¼ in. angles around all their edges. These rested in the rebates of the coping, and on a 5 in. by 3 in. by 11 lbs. rolled steel joist built in lengthways across the well. The plates were fitted around the syphon-pumps.

The base-stones on the top of the piers for the standards were 4 ft. 6 in. by 3 ft. 6 in. by 1 ft. thick, of local granite dressed, and had the sunk flat and the hollows for the guide-rail wing plates and rivets, also the two holes for Lewis bolts, as described for the stones built into the walling. They were pierced, for the four 2½-inch diameter holding-down bolts, with holes 3¾ inches diameter, to allow for adjusting. Directly over the intermediate guide-stones in the walling and equidistantly between the base-stones, were the top guide-stones measuring 2 ft. by 18 in. by 12 in., similar to those set in the bottom of the wall and with the sunk flat, hollows, and the Lewis bolt holes. The coping to the tank and dry well, also these pier base-stones and the top guide-stones, were all set in 1 and 1 cement and sand.

The wall being constructed, the inner upright framing and the strutting for the shields were taken down and the inside excavation begun. The excavation was carried down to 24 feet below the level of the top of the coping, which depth allowed for the 12 inches of concrete on the top of the cone. A three-sided wooden shoot was attached under the mixer to direct the concrete into the tipping skips, which were filled and run all over the cone top and emptied in place. Then the concrete was spread out and rammed; the area being gradually closed in. The concrete was not laid up to the corner of the cone-slopes, but was kept back about 3 feet, thus avoiding a joint along such a critical line. The concrete for the slopes was similarly run round in skips on the outer edge of the cone-top (where not concreted), and tipped down a three-sided shoot lying on the excavated slope to the bottom, or to some previously laid concrete, where it was shovelled into position, and then rammed. A portion of the bottom floor about 18 inches wide or so was also laid at the same time, thus avoiding a joint at the bottom corner of the slopes; it being a continuation of the slope concrete carried out at the bottom. It was left with roughish edges for uniting with the remaining portion of the floor concrete, when it was eventually laid. The junction of the cone-slopes with the top of the cone was also executed—the edges being swept clean and well watered; and with good fat stuff put at these seams, no trouble was experienced in making the scar sound and satisfactory all round. The finished diameter of the cone-top is 99 feet, and the width of the bottom floor from the face of the walling to the corner of the slope is 7 ft. 6 in.; thus giving a slope back of 18 feet on a rise of 11 feet, or an angle of 1·63 to 1. Opposite each wall-pier, and at a radius of 56 feet from the centre of the tank, there was constructed on the cone-slopes a concrete haunch measuring 4 ft. 6 in. square, on which the brickwork to carry the bases of the columns to support the timber framing was built. These were carried up to 2 ft. 6 in. below the level of the cone-top (and were constructed inside timber framing, which was strutted from the wall), and were concreted at the same time as the slopes were concreted; so that all was well knit together.

It will probably have been observed that, since I stated a portion of the floor was laid when the walls were constructed and a further portion of it was laid when the slopes were done, the central piece of the floor was still undone. The floor was 12 inches thick on each side, so it will be understood that a channel some 4 or 5 feet wide and 12 inches deep was left, along which rain and water from the excavation made its way to the outer sump. This sump-hole was below the level of the tank-floor; and a square opening, covered in front with a grating (to prevent the passage of any material likely to injure or block the foot-valve on the suction pipe), was left through the tank wall at the very bottom, in line with the channel in the floor, which thus connected the sump with the tank proper. Owing to the quantity of water (which on occasions was considerable) that was delivered to the pump and conveyed along the gap in the floor, it was deemed advisable to pipe this entire circle to carry away the water while the floor was being laid. A shallow groove was scooped out on the rock bottom, and 4-inch drain pipes were laid in same with open joints, and were held in place with loose granite rubble which filled in the hollows at the side of the pipes, when it was all covered over with thin tarred roofing felt, upon which the concrete of the floor was laid. This felt prevented the underneath water from rising up through the concrete and washing out the cement, and the weight of concrete prevented the felt from being lifted by the water. There were also several weeps and sweatings on the cone slopes in different parts; and where these occurred, similar shallow grippes were sunk in the rock to all places from which water appeared to ooze. These were continued down the slopes and across the floor to Y-junctions on the 4-inch main subsoil drain on the bottom floor. These grippes were all filled up with loose granite so as to leave no cavities, and were then covered over as before described with felt, and the concrete of the slopes laid on them. At a few places around the walls water had made its way through fissures in the rock, and was causing leaks into the tank, in varying quantities, largely dependent on the weather. To remove these leakages, chases, 4½ inches deep and 3 inches wide, were cut at such places up the face of the concrete walling (to where the water was issuing); and wrought-iron pipes 1 inch or 1½ inches diameter were inserted, with a bend turned in towards the rock at the leak. The pipes were then carried down in the chase to the bottom, provided with another bend, then carried across the floor in another chase to, and coupled into, the side of the 4-inch subsoil drain. The chases



were afterwards filled in solid with neat cement, and boarded and strutted up until set. In this way were all the leakages into the tank directed into the subsoil drain, and thus conveyed to the pump, which lifted the collected water into a 9-inch stoneware drain connected with the 24-inch storm-water culvert in the main road outside the gasholder site.

The entire circle of the floor was not completed at that time; but against the entrance to the sump-hole a distance of some 12 feet or so was left unfinished, with the ends of the 4-inch subsoil drain left exposed, so that any excess of water coming down could rise up over the floor, and, if necessary, rods could be passed up the pipes either way to clear them. The closing up of this gap was not done till just before the tank filling was commenced. Any slight damp places on the seams of the concrete walling, or through the concrete proper, which were likely to prevent the adhesion of the cement rendering to the wall, were cut into for some 2 or 3 inches, plugged up with oakum well caulked in, and afterwards filled up with neat cement, and boarded up until set as before adopted for the piped leakages.

At the centre of the tank, a brick pier had to be built to carry the centre cast-iron column supporting the timber framing. The concrete on the top of the cone was roughened to offer a key for the rendering; and a patch large enough to accommodate the footings of this central brick pier, and 1 foot beyond, was rendered ¾-inch thick in two-coat work—¼ inch of 2 and 1 sand and cement, and ½ inch of 1 and 1 sand and cement—having the joints breaking, and with rough edges for joining up later. The top surface of the rendering was in all cases left with a fairly smooth face from a hand wooden float, and not trowelled. In line radially with each alternate main pier of the wall, and at a radius of 28 feet from the centre, ten similar patches were rendered on the cone top to accommodate the footings of intermediate brick piers; and the twenty concrete haunches (constructed on the cone slopes, in radial line with each wall pier) were also similarly rendered on top and on their three sides. This rendering was continued down on to the slopes all round and with rough edges, so as to avoid a joint in the rendering occurring at any of the arrises of these concrete piers. All these patches on the top of the cone were subsequently joined up with ¾-inch cement rendering similarly laid in two coats, and finished off with a hand floated surface. As there were, in some places, greater thicknesses than ¾-inch left on top of the concrete, the hollows were made up with 3 and 1 sand and cement (corresponding with the consistency of the concrete), before the rendering was applied; and, where the surface of the concrete appeared to be too smooth, it was gone over lightly with a pick to make a sufficient key for the filling up or the first coat of rendering. The required thickness of the top coat was secured by laying ¼-inch wooden

"screeds" on top of the first coat; and a good hold of the top with the bottom coat was doubly obtained by (1) its being applied while "green," and (2) owing to the surface of the under coat being scored all over with a hand-float having a brad in it.

The rendering of the walling was ¾ inch thick all over; and the face of the concrete was constructed this distance back from the face of the guide-stones, coping, and pier-stones. It consisted of two coats of similar thickness and consistency to that on the cone top, and was carried out (working from the top downwards) in six tiers about 5 ft. 6 in. deep each; the circular seams being adjoining the guide-stones and also intermediately between. Scaffolding was erected inside the tank with platforms at convenient heights to suit this, and the face of the concrete where required was similarly picked over lightly to roughen it for the first coat. The rendering of the slopes was done similarly to the top of the cone. The landing stones were forty in number and 33 feet from the coping to the top, and were placed 12 inches clear off the centre line of each bottom guide-stone, so as not to foul the roller carriages on the bottom of any of the gasholder shells. They were of local granite, hammer dressed on the faces, and measured 5 ft. by 18 in. by 12 in. deep, and were merely laid on the floor and bedded on sand. After being tapped down in place to secure an even bed, they were carefully levelled all round at their bearing points, and, once all were dead level, and true one with the other, they were pointed in with neat cement all around their edges, and behind against the walling, to retain the bedding sand. Owing to the natural granular roughness of these stones, the bedding had to be somewhat thicker with some of them than was anticipated; and as, of course, the level of the "highest" stone governed the level of the entire forty (since they all had to be truly level), it was necessary to level the complete circle of stones before they were begun to be pointed in.

The brick-pier in the centre of the cone was built 7 feet high, including the 3 ft. 6 in. square by 9 inch thick stone on top. The pier was 3 ft. 9 in. square (under the stone) for 2 feet from the top, 4 ft. 6 in. square for another 2 feet, and 5 ft. 3 in. square for a further 2 feet, and with four course footings each projecting 2¼ inches all round beyond the one above; thus making the very bottom footing 6 ft. 9 in. square. The ten intermediate piers were 6 feet high, including 2 ft. 3 in. square by 6 inch thick top stone; and they were each 2 ft. 3 in. square under the stone for 2 ft. 6 in. from the top, 3 feet square for a further 2 ft. 6 in., and with four course footings each projecting 2¼ inches beyond the one above, so that the bottom footing was 4 ft. 6 in. square. The twenty outer piers were identical with the intermediate ones, only that they were 1 foot less in height; there being 2 feet of each of the 2 ft. 3 in. and 3 feet square brickwork, instead of 2 ft. 6 in.

The cast-iron columns supporting the wood framing were carried on these brick piers last mentioned, each being 22 ft. 6 in. high from base to the inside of the jaw at the top, so that it will be gathered that the rafters of the crown framing had a sweep corresponding with this 12 inch difference (in the height of the piers) at the column centres. The outer ring of the columns being 56 feet from the centre of the tank, while the intermediate row was 28 feet, it follows that the curve was equal to a rise of 1 foot in 28 feet, which came out, on being scribed, to an arc of a circle of some 350 feet in radius.

The 31 cast-iron columns were each 22 ft. 6 in. in height + in section, 12 inches wide point to point, and with ⅝ inch strengthening ribs cast across the corners all round at 4 ft. 6 in. centres. The columns were each held down to the brick piers with four bolts 1¼ inches diameter, having 6 in. by ½ in. flat holding-down plates, laid in the form of a continuous square. These were placed in the brick piers 5 feet below the top of the stone in the case of the centre-column, and 3 feet in all the other instances. The centre-column was of 1 inch metal throughout, and had a 1½-inch thick base 3 ft. 4 in. square with the necessary bolt-holes, and having ten pockets 6 inches deep (cast on at the proper angles) to take the ends of the struts supporting the main rafters. It also had a 1 inch thick top plate 2 feet square, on which the ends of the ten main rafters rested, and which had four holes at 12-inch centres for ¾-inch bolts. The twenty outer and the ten intermediate columns were of ¾-inch metal throughout, having 1 inch thick base-plate 2 feet square with the necessary bolt-holes, and having at the top a fourway jaw (at the angles required), into which the rafters and purlins fitted; and they were each held in place by ¾-inch bolts. At 9 feet up from the bottom, pockets 9 inches deep were cast on (at the required angles), to take the ends of further struts supporting the rafters. The twenty outer columns were tied to each other by means of ¾-inch diameter cross bracing, bolted top and bottom with ¾-inch bolts to column webs; each rod having a 6-inch long tightening screw with right and left handed threads.

The timber framing over the tank to carry the crown of the gasholder when at rest was of pitch pine throughout, and consisted of ten main rafters of 11 in. by 3 in., in line with each alternate pier on the walls; and, passing through the jaws at the top of the intermediate and outer columns, they extended to 8 feet from the vertical line of the tank face, and were curved to the radius of 350 feet. The inner ends of these main rafters were chisel-pointed, so as to meet at the dead centre of the tank, and rested on top of the centre column. There was a ½-inch mild steel plate, 3 feet diameter over the top of same, sunk in flush—notches being cut in the rafter-ends to permit of this. Each rafter-end was held in place by three counter-sunk headed spikes 6 inches long through this top plate, which latter was secured to the centre column with four ¾-inch countersunk-headed bolts. Between, and framed into, these main rafters, and resting in jaws at the top of the intermediate columns, ran (at 56 feet diameter), 11 in. by 4 in. main purlins, at the middle of which sprang the secondary rafters of 11 in. by 3 in.; and they passed through the jaws at the top of the remaining outer columns to the same distance from the tank face as the main rafters.

Equidistant between the main purlin and the centre of the tank ran two rows of purlins, the inner being of 9 in. by 3 in. and the next 9 in. by 4 in., all framed into the main rafters at each end. At about 15 inches from the ends of the main and the secondary rafters ran a row of outer purlins (straight across) of 11 in. by 3 in., which were framed into the main rafter at one end and the secondary at the other, and were carried in special cast-iron shoe-heads of ¾ inch metal throughout, having three jaws (for purlin end each side, and rafter), and with a square socket underneath to fit over the upper end of the strut, all at the required angles. Equally divided between this outer purlin and the main purlin, ran three other rows, the outer one of which (the second outermost) rested in the jaw at the top of the outer column, and was 11 in. by 3 in. The next row was also 11 in. by 3 in.; but the one next the main purlin was only 9 in. by 4 in., and all were framed into the main rafter one end and the secondary rafter at the other. There were thus seven rows of purlins altogether, the ends of the third and sixth rows (from the centre) being carried in the column jaws at each end. On the base of the centre column, and part of the way up on each intermediate and outer column, pockets were cast. Into these pockets were inserted 6 in. by 6 in. struts, which stretched out to near the junction of the adjoining purlin with the rafter, so that along each main rafter the first purlin was supported from the centre column, the second and fourth from the intermediate column, the third resting in its top jaws, while the ends of the fifth and seventh purlins were supported from the outer column, with the sixth in the jaws of same.

There being twice as many outer columns as intermediates, the secondary rafters were also strutted up (from the outer columns) at the fifth and the seventh purlins; the sixth being carried in the jaws. As the outer two bays (enclosed by the main and the secondary rafters, and purlins) were so large, measuring some 20 ft. by 10 ft. and 16 ft. 6 in. by 10 ft. respectively, which would cause considerable sagging in the gasholder crown sheets later on, radial bars of 9 in. by 3 in. were framed across the centres, dividing them into equal portions. The ends of all purlins, rafters, and struts, where they rested in the jaws or pockets of the columns or shoe-heads, were secured by ¾-inch bolts drawn up tightly through same; and over each junction or intersection of purlin with rafter (except where they rested in the column jaws), flat iron straps were sunk flush 18 inches long, of 2-in. by ⅛-in., which were secured with five spikes 6 inches long to each. The junction of the timbers was made with a trimming joint, morticed and tenoned, with bevelled haunching. The main rafters were in three pieces; being framed together at the intermediate and outer columns with a halfened joint. The secondary rafters were in two pieces; the joint being in this case a scrafed one, and at the fifth purlin.

The struts at their top end were forked (except the outer ones, where they entered the shoe heads); and the rafters were inserted into the knotch thus formed and held by ¾ or ⅞ inch bolts, with ¼ inch thick washers 3 inches square, against the timber.

The Inlet and Outlet Pipes.

The 24-inch inlet and the 30-inch outlet pipes were continued through, in the grippe below the bottom floor of the tank, at 4 feet centres. The inlet-pipe was carried up inside the tank at 14 feet to the centre of same (from the face of the tank), and stood 3 inches above the overflow level of the tank. It had a ducksfoot bend at the bottom, having a sole 4 ft. 6 in. by 3 ft. 6 in. and 1¼ inches thick, which rested on a granite block 5 ft. by 4 ft. by 12 in. thick, and was fastened to same by four 1¼ inch Lewis bolts leaded into stone. The slopes of the cone were also cut into, to allow of the grippe being carried further on to accommodate the bend and the vertical piping. The outlet-pipe travelled up on a slope to the top of the cone by means of a long spring bend of 142° 6 feet from the wall of the tank; and at the cone top another bend of 144° was inserted, and the pipe was then carried along with a gradual rise to 60 ft. 6 in. to its centre (from the face of the tank), where a ducksfoot bend, having a sole 5 ft. by 4 ft. and 1¼ inches thick, which rested on a granite block 6 ft. by 4 ft. by 12 in. thick, and was fastened to it by four 1¼ inch Lewis bolts leaded into stone. The outlet-pipe was carried up therefrom to 9 inches above the overflow-level of the tank. The inlet and the outlet pipes were therefore widely separated; being 46 ft. 6 in. between their centres.

The inlet-piping of 24 inches diameter was ⅞ inch thick throughout, and the 30-inch outlet-piping 1 inch thick; the joints being of the ordinary spigot and socket type in each case except the vertical legs inside the tank, which were flanged. The top of each pipe inside the tank was surmounted with an open guard of a truncated cone shape, for the purpose of guiding the manhole chambers fixed to the gasholder crown over the top flanges of these pipes. The guard over the inlet-pipe was 12 inches high and 1 ft. 9 in. diameter at the top, and consisted of four 3 in. by ⅝ in. flat bars kneed and bolted with ¾ inch bolts to the top flange, and bound together by an open ring of 2 in. by ¼ in. half-round steel at the top, and all riveted together where they intersected. The outlet-pipe guard was a much higher one

owing to the fact that the chamber on the gasholder crown in this case was necessarily deeper, to secure its being sealed in the tank water, and because an uneven settling of the inner lift would throw this chamber more out of truth, and so run a greater chance of fouling the top of the outlet-pipe. This guard was 2 ft. 6 in. high above the top pipe flange, and consisted of a ring of 3 in. by 4½ in. (wide) by ½ in. angle and 3 ft. 4 in. outside diameter, having three straps of 3 in. by ½ in. flat riveted to same each side, and carried up to and over the centre, where they were 9 inches wide at their crossing, and were there fastened together with a ¾-inch bolt through all three. This outlet-guard was secured to the top flange of the pipe with ten ¾-inch bolts. The inlet and outlet pipes were carried through the outside wall of the dry well to a valve-house adjacent, where were the controlling valves.

The tops of the inlet and outlet pipes in the dry well were surmounted with a 2½-inch diameter force and lift pump, which stood above the chequered plate cover, at a convenient height for pumping. The syphon-tube was 1 inch diameter from the bottom up to about 20 feet, where the lifting-bucket was situated; the size of the tube being here enlarged to allow of the withdrawal of same at any time should need arise. After the pipes had been tested and proved tight, the grippe across the floor and into the slopes was filled in with fine fat concrete (the sides of the entire grippe having been previously rendered all over), which was well worked all round the pipes, up to the same levels as the existing floor and cone slopes. It will be understood, therefore, that, though the pipes are really within the rendering over the face of the concrete constituting the tank proper, and were buried in, they appeared to come up through the concrete and finished floor and cone slopes subsequently when completed.

The 1-inch Lewis bolts 9 inches long were placed in position, and a clay runner formed, then run with lead into the guide-stones, and caulked round their necks, after which the forty guide-rails of 6 in. by 2½ in. by 7/16 in. channel steel were placed in position and temporarily bolted up. They were subsequently correctly set in position at the top, and then plumbed down throughout their entire lengths. Slot-holes, 2 inches long, were provided in the 6 in. by ½ in. by 18 in. flat wing-plates on the guide-rails, to allow for lateral adjustment. The guide-rails at the twenty main piers projected 12 inches above the coping top; the other twenty being level with it. The gap in the bottom floor leading to the outside sump was next closed up, preparatory to filling the tank with water. The two ends of the 4-inch subsoil drain under the floor were coupled up with bends and a Y-junction, and then carried through the opening in the tank wall already described, after which all was filled in with strong fine concrete and rendered, thus completing the floor.

The outer sump recess was about 4 feet square in the hard rock at the bottom, and 6 feet square on the level of the pump-bed, which was some 20 feet under the coping; so, as the division-wall between the tank and the sump was not strong enough to withstand the ultimate pressure of water from inside when filling the tank, I had the subsoil drain coupled to a 5-inch syphon-pot, which was placed in the furthest away corner of the sump-hole, and into which the rose end of the pump suction was led. This corner was then boarded in, and good fine concrete was lowered and emptied down behind same and hard up to the back of the existing tank wall, and as high up as the pump-bed. From this level up to the coping, and across the full width of the sump-hole, the tank wall was thickened and built with a batter of from 4 feet thick at the pump-bed to the existing 2 feet at the coping. The remaining triangular corner of this sump-hole was used for pumping through, till the tank was within 1 foot of being full, and was sufficiently high to withstand any outside pressures, when the pump was removed and the hole completely filled in solid with cement grout and concrete.

Filling of the Tank.

The water was admitted to the tank by means of a 3-inch cast-iron main, coupled to the Water Company's distributing system, and provided with a sluice valve and meter. Thirty days were occupied in filling. The meter-index indicated that 2,907,000 gallons had been passed into the tank, which was equal to an average of 97,000 gallons per day of 24 hours. The total water capacity of the tank up to the overflow level is just on 3,250,000 gallons. The tank was under test for 45 days thereafter, with daily observations and records being made. Allowance was made for rains and evaporation, by means of a stationary improvised rain gauge, placed on top of the centre plate of the timber framing, which was exposed to all weathers, similarly to the tank. This was daily measured; and I further compared it with the statistics issued by the Plymouth Meteorological Office. The results of the 45 days' test showed that there was a net gain on the water-level of ¼ inch; whereas 5 15/16 inches of rain had fallen during that period, showing therefore an actual loss of 5 11/16 inches, or an average loss of only ⅛ inch per day over the entire 45 days. This loss was ½ inch per day at the commencement, and gradually slackened to nothing, as is shown by the fact that the first week the loss was 2 13/16 inches, while the last weeks only ¼ inch diminution in the level was shown.

The test was further continued, with weekly readings, until the end of February; and the gradual taking-up of the loss is indicated in the following figures: From Dec. 11 to Jan. 1, 0·229 inch loss per day. From Jan. 1 to Jan. 25, 0·036 inch loss per day. From Jan. 30 to Feb. 28, 0·0021 inch loss per day. Though these losses were very trifling, still I had some dry cement and horse dung sprinkled over the surface of the tank, also down by the side of the walls; and they may have had some effect in thus reducing the loss. But the results were nevertheless considered by everyone concerned to be eminently satisfactory; and this condition has, I am very glad to say, been steadily maintained up till now. It is pleasing to record, also, that the entire circumference of the tank (measured on the edge of the coping) was exactly correct, and that seven out of the ten diameters, across from pier to pier, were each within ¼ inch of being dead correct (either short, or full). The greatest diameter was 150 ft. 0⅞ in.; the smallest, 149 ft. 11½ in.; the average of all ten being exactly 150 feet, as it was intended it should be, and as designed.

(To be continued.)

YORKSHIRE JUNIOR GAS ASSOCIATION.

In the absence of the President, the Senior Vice-President of the Association, Mr. S. W. Shepherd, occupied the chair at the meeting held on Saturday at the Municipal Technical College, Bradford, when, probably owing to special and powerful counter-attractions in the city, the attendance was considerably below its ordinary level.

Mr. H. Townsend, jun. (Wakefield), opened the proceedings by reading a paper entitled

SOME NOTES ON A SMALL ELECTRIC LIGHTING PLANT AT THE WAKEFIELD GAS-WORKS.

The author commenced by explaining that, in order to meet the present requirements of the Home Office, they had lighted the purifying-houses, &c., by means of the electric light, generated by a gas-engine; and the plant was used for lighting all parts of the works where there was any possibility of danger. As the main object was safety, a low voltage had been adopted, as there was less liability of sparking. This had proved an advantage, as they had been able to adopt metallic-filament lamps without making any alterations in the fittings. These lamps made a great difference in the load, and consequently a greater number of lights could be supplied by the same plant.

The following are the principal features of the plant: The main cables are overhead and are carried on pot insulators, the wires themselves being heavily insulated; and wherever they enter a building, they are enclosed in wrought-iron tubing. The electric bulbs are enclosed in a form of safety lamp; the switches are of an enclosed air-tight pattern contained in cast-iron boxes; and the fuses are made arcless by being wrapped in asbestos sheeting, enclosed in a sealed mica tube, and then fixed in wooden boxes made air-tight by means of white lead. There are one or two points in which electric differs from gas tubing. Bends are made of larger size pipe with socket ends, instead of screwed on the outside, as it is easier to thread the wires through them. The pipes are made smooth inside to prevent damaging the cables, and are japanned to prevent rust. They are also much thinner than ordinary gas-tubing.

The generating plant, which is housed in a well-ventilated dry room apart from the manufacturing plant, where it can be kept free from coal and coke grit and from any escape of gas, consists of one 10 B.H.P. horizontal gas-engine, with one heavy fly-wheel and an outer bearing. At first, this engine was fitted with a new type of ignition block; but neither it nor one of the vertical tube pattern subsequently tried worked well, so electro-magnetic ignition was substituted, and it has proved very satisfactory. A point worth consideration is the lubricator on the crank end of the connecting-rod. As the engine may be wanted for fifteen hours at a stretch, and it revolves at 240 revolutions per minute, the lubricator should be either a large one, or preferably one which can be filled while the engine is in motion, of a similar pattern to those usually fixed on exhauster engines. One of the most important points about the engine is its steady running, as the slightest variation in speed makes the voltage, and with it the light, fluctuate. To ensure steady running, a heavy fly-wheel and a good type of governor are essential.

The dynamo is a 6 kilowatt machine, generating 110-volt continuous current, and is compound wound. This part of the plant gives very little trouble when it is properly looked after; but a point which might be mentioned is the belt. The dynamo is driven at the rate of 1125 revolutions per minute from the fly-wheel of the engine. As the fly-wheel is about 5 feet diameter, and the pulley on the dynamo only 10 inches, and the drive a short one, any ordinary belt fastener would cause a knocking which would result in the light jumping and making an unpleasant noise. For these reasons a gutta-percha belt was used and spliced together, so that it is practically jointless. The rest of the plant consists of the shunt regulator, the switchboard, the usual gas anti-fluctuator, tanks, and exhaust-box.

The main cable is divided into four different circuits: (1) This wire supplies current for the purifying-houses, revivifying-floors, lime-shed, washer and tar-extractor rooms, and by the tar and liquor tanks—a total of 25 lamps, all 32-candle power. (2) This is the retort-house wire. It supplies current for the platform by the arch pipes and for lights by the governors, tar-towers, and staircases—in all, 20 lamps of 32-candle power. (3) The yard wire includes the valve, governor, and meter houses, the benzol

plant, lights by the holders, and a few outside lamps near the seal-pots and syphon-pumps; 23 lamps of 32-candle power each. (4) The power cable is a special wire for the drilling-machine plugs. At the top of the switchboard the voltmeter and the ammeter are placed. The former shows the strength of the current, the latter the load, or quantity of current being used.

The author went on to say that in connection with the electric light, they have at Wakefield a portable cable lamp, consisting of one of the ordinary safety fittings, but besides the flintwell globe there is a wire guard on which it stands. The cable, which can be of any length, is carried in an india-rubber tube wrapped in wire to protect it. Wherever any lamp is likely to be wanted, sockets have been fixed, and a plug on the end of the cable fits into any of these sockets. If the cable is jerked at all sharply, the plug is liable to fall out; and if it did so, it would cause a spark. This, of course, is one source of danger. This cable lamp, while being very handy and useful, has its disadvantages, one of which has just been mentioned. Another drawback is that if the cable gets twisted at all sharply it is liable to fuse at the weak place made by the twist. This can be partly safeguarded by having an arcless fuse close to the actual bulb. By this means, if the resistance of the wire becomes above the normal, the fuse will go off instead of the wire. In order to avoid twisting the cable, it is advisable to keep it wrapped round a drum. But even if these precautions are taken, the lamp is still not perfectly safe, and should not be used where there is danger.

For use in dangerous places, Mr. Townsend has two safety hand lamps. One of these has three accumulators which supply electricity to an 8-candle power metallic filament bulb. They are enclosed in a brass case, and the lamp fits on the front; being protected by glass and metal covers. The switch is air-tight, and the whole lamp can be locked up. This is a pit lamp, and can be used anywhere. It will give a continuous light for about seven hours, or if only lit for a short time it will last for fifteen hours. The other lamp is of similar construction, but has four accumulators and a metallic filament bulb with a 10-candle power light, and will keep going for a longer time. This lamp is enclosed in a wooden case, and cannot be locked up. It is made specially for use in gas-works; its one drawback being that it is considerably heavier than the pit lamp.

Both of these lamps require charging once a month, whether they are used or not. Three points need careful attention: (1) To see that the lamps are charged the right way round—the positive terminal of the dynamo coupled to the positive terminal of accumulator and the negative to the negative; (2) that it is kept always upright, otherwise the acid in the accumulator may be spilt, which does considerable damage; and (3) that the lamp is kept filled with acid of the correct strength.

They have at Wakefield one very handy tool—a portable electric drilling machine. This has a long cable attached to it, and can be used at any place where there is a power socket. These sockets are similar to the lamp sockets, only stronger, and they are fed by a special main from the dynamo. The machine consists of a small motor and suitable gearing which connects it to the chuck spindle. This chuck will take drills from ¼ inch to 1¼ inches; and as the motor is enclosed, it is fairly safe. It can be fixed at any angle, like any ordinary ratchet-brace; and two people can easily operate it, as it does not weigh much. As it drills holes more quickly than any ordinary belt-driven machine, it saves time whenever much drilling has to be done; and it has proved very useful.

Mr. Townsend concluded by saying that the cost of running the plant described is small, as the man who looks after it at night also attends to the coke-conveyor and other machinery. The maintenance, including new wiring, he does himself, and it takes him, on an average, about ten hours per week; so that it is a comparatively inexpensive plant to run, while it has been found very useful.

The members listened to the paper with additional interest as coming from one of the youngest—even if not absolutely the youngest—members of the Association. It was illustrated with examples of the lamps, fittings, &c., described, which were subsequently examined by those present; and congratulatory remarks followed from several members.

Mr. HENDERSON told how the sudden emergency of night work on a large damaged main was safely met by borrowing a number of miners' lamps from a neighbouring colliery. As the result of the success of this experiment, these lamps were adopted for all regular work in similar dangerous circumstances; and their safety and utility had been amply demonstrated.

Mr. HILL thought the policy of lighting gas-works by electricity was open to question (except, of course, as regards a few dangerous positions). In any case, however, it was wise for them to know what electricity could do; and they need be no more reluctant to use it in exceptional circumstances, where it had advantages over gas, than electricians were in using gas for their engines. At the same time, it was especially desirable that they should know something of its vagaries. He had noticed the repeated cautions given in the paper as to the need of avoiding this and doing the other, lest, after all, accidents or breakdowns should occur. This candour was what one expected from a gas engineer's son, though he (Mr. Hill) doubted if they would have heard any such emphasis laid on it by an electrician. He had recently had to deal with an outbreak of fire from a damaged gas-pipe in a laundry. This on investigation was found to have originated in a defective electric motor, which allowed an induced current to travel along a steam-pipe and then spark across to the gas-pipe. After a considerable amount of protestation on their part, he had finally wrung from the electrical officials a reluctant admission as to the correctness of his diagnosis. Directly afterwards he had two similar cases occurring.

Questions Discussed.

The meeting afterwards addressed itself to the discussion of a few practical questions suggested by the recent experiences of some of the members.

"*What is a good method of ascertaining the depth of tar in a large underground tank in which the tar settles by gravitation?*"

Mr. SAVILLE spoke of the use of a hot rod for dipping such a tank. He said the liquor rapidly dried off; but the tar mark showed plainly.

Mr. LAMB advocated a well-greased rod.

Mr. ATLEY recommended a charred rod, and spoke of his successful use of these appliances.

Mr. GILLETT exhibited an arrangement that avoided any danger of tar marks being washed off by a top layer of light oils. It consisted of a bottle attached to a collar, which could be fastened at any height on a wooden rod. The bottle was corked, and a long string was securely fastened through the cork. The rod was lowered till it reached the bottom of the tank, the cork was pulled out, and then the whole arrangement withdrawn, and the contents of the bottle examined. This was repeated with the bottle at various heights of the rod, until on withdrawing it from the tank, liquor with just a thin layer of tar was found in the bottle. The distance from the bottom of the rod to the lip of the bottle gave the depth of the tar.

Mr. HILL described a somewhat similar arrangement, where a set of six cups were attached to a case which slipped over a rod and could be adjusted to any height. This was then dipped down the tank, withdrawn, and the contents of the various cups were examined.

Mr. ROPER spoke of having seen a long rod, of about 2 inches square section, with a number of pockets notched out in the wood at various heights.

"*What is the most efficient and practical way of slaking coke with a minimum of water?*"

Mr. M'NAB, Mr. SUTTON, and other members, referred to the usual methods of employing a fixed sprinkler with various kinds of heads.

Mr. C. TOWNSEND emphasized the advantages of drawing the hot coke through water as in a De Brouwer conveyor. He said it was striking how little water was absorbed by the coke; and the surplus ran down the trough, could be passed to a well, and pumped up again for subsequent use. An even better way was to quench it by sprinkling in a covered conveyor trough. This used a minimum of water, as much of the slaking was done by the steam; and by excluding air from the coke while hot, this was kept a good colour.

Mr. CRANFIELD wondered if the framer of the question had not also in his mind the need of producing a coke with a minimum quantity of water absorbed in it. He said that with a possible extension of the use of their coke for suction-gas plants and other gas-producers, consequent on the increasing price of anthracite, they would do well to endeavour to secure for their coke a low moisture content, especially as they might probably have to face the competition of the coke-oven article. Defective methods of slaking had a good deal to do with the earlier prejudices against the coke from modern recovery ovens; and any needless excess of moisture reduced its efficiency in the blast-furnaces, as it also did with gas coke as a fuel.

"*In 'gaiting' a setting of direct-fired retorts, is it wiser to have sight-hole plugs out or the damper eased a little?*"

This question failed to elicit any well-defined preferences, inasmuch as most of the members present had no personal experiences of direct-fired settings.

"*In putting down retorts (direct-fired), which is the better method—to draw the coke when gas making is finished, or to leave it in the retort?*"

"*In case it is necessary to miss a charge, owing to the holders being full, should the last charge be left in the retort or not, and why?*"

Mr. SAVILLE advocated leaving the coke in the retort in the first case, as it made the cooling-down more gradual, and therefore tended to lengthen the life of the retort. The coke, too, in cooling away from the air would be of a better colour. In the second case, the plan sometimes adopted was to insert heavier charges, and leave them in double time.

Mr. ATLEY agreed with this view, but said his experience was that this coke, so far from being of a good colour, was so red that they could not sell it, and had to utilize it in their own furnaces. He admitted that their coal contained much iron, and in other cases the coke might not show so marked a deterioration.

Mr. SUTTON strongly urged the drawing of the coke, so that the scurf could be taken off easily, as its removal from cold retorts was a difficult operation, and apt to be disastrous to the retorts.

Mr. ROPER and Mr. GILLETT quoted their recent experiences,

and agreed in advising the removal of the coke. They remarked that if let down for the summer, this permitted of the removal of the scurf, and revealed any cracks that needed repair; while in a recent case, when fog caused a number of such settings to be requisitioned again before they had become quite cold, those in which the coke had been retained certainly gave more trouble in being brought up to working heats again.

Mr. M'NAB pointed out that in both cases the prolonged retention of the charge passed forward a needless volume of low-grade gas and sulphur impurities produced in the closing periods of carbonization.

At the conclusion of the ordinary business, the Chairman introduced Mr. Furniss, of Slaithwaite, who was present at the meeting, and would be at later ones, as the official representative of the Manchester and District Institution of Gas Engineers. Mr. Furniss thanked the members for their cordial reception, and explained that he was really there as a substitute for the Secretary, Mr. Whatmough, who, by the constitution of both Associations, was, with the President, an *ex-officio* member of the Council of the Junior Association. He had had much pleasure in listening to the discussions, and had enjoyed their business-like methods. Some of their subjects might seem to be concerned with comparatively small matters; but they were every-day ones, and as such were of pressing importance, and concerned all of them. He had read their proceedings from year to year, and anticipated much pleasure in being present at their meetings. It was often a good thing, and always stimulating and refreshing, to hear stock ideas and well-worn methods attacked with all the vehemence and courage of youth.

HEAT TRANSMISSION IN BUILDINGS.

Cost of Hot Water, Gas, and Electricity.

At the Meeting of the Junior Institution of Engineers last Friday, a paper on the above subject was read by Mr. Kenneth Gray, a Past-Chairman of the Institution. In the course of it, he referred to the great advance that has been made within the last ten years in central heating—most new buildings of any size having now a heating plant. The system in most general use in this country is low-pressure hot-water heating; water possessing just such qualities as make it an excellent medium for distributing heat throughout a building. The author went on to point out that the complete apparatus consists of three essential parts—the boiler, where the temperature of the water is raised; the main pipes, through which it is led to the points where heat is required; and the radiators, where it gives out its heat to the surrounding air. Radiation, convection, and conduction—the three forms in which heat transmission can take place—all take their part in unison. The science of the boiler maker consists in securing the rapid transmission of the heat from the fire to the water; of the engineer, in conveying it from the boiler to the radiators. The greater the velocity of the circulation, the greater the efficiency of the boiler becomes, and the greater the efficiency of the apparatus. In designing a boiler, as in designing a heating apparatus, the cardinal principle involved is the rapidity of the transmission. As the science of heating stands to-day, it is possible to utilize in the actual work of warming a building from 60 to 70 per cent. of the heat units developed in the combustion of the fuel. This is in the case of low-pressure hot-water warming apparatus, which compares very favourably with any other method of heating at present in use.

Mr. Gray then submitted the following comparison of three different methods of heating.

Low-Pressure Hot-Water Heating Apparatus.

With coal at 20s. per ton, approximately, 9 lbs. cost 1d.
Nine pounds of coal on combustion yield 9 × 12,000 B.Th.U. = 108,000 B.Th.U.
Assuming an efficiency in the apparatus of 66⅔ per cent., the total amount of heat used that can be bought for 1d. = 72,000 B.Th.U.

Gas Heating Apparatus.

With 1000 cubic feet of coal gas at 2s. 6d., approximately, 33 cubic feet cost 1d.
33 cubic feet of gas yield on combustion 33 × 700 B.Th.U. = 23,100 B.Th.U.
Assuming an efficiency of 100 per cent. in gas heating apparatus, the amount of heat that can be bought for 1d. = 23,100 B.Th.U.

Electric Heating Apparatus.

One Board of Trade unit of electricity = 2,653,800 foot-pounds.
The mechanical equivalent of heat = 772 foot-pounds.

Therefore 1 unit of electricity $= \frac{2,653,800}{772} = 3437$ B.Th.U.

Assuming an efficiency of 100 per cent. for electric heating apparatus and current at 1d. per unit, the heat that can be bought for 1d. = 3437 B.Th.U.

Mr. Gray added that the high cost of electric heating is due to the low efficiency of the steam-engine; for though it takes only 1 B.Th.U. to raise the temperature of 1 lb. of water 1° Fahr., it takes 966 B.Th.U. to convert 1 lb. of water at 212° Fahr. into steam at the same temperature. When the steam has done its work in the engine, it still remains steam, and only a small proportion of these 966 units are snatched from it in the condenser and returned to the boiler. It is here that the chief loss occurs, which keeps the cost of electricity as a heating agent at its present prohibitive price.

ELECTRICAL PROPERTIES OF FLAME.

At the Royal Institution on Friday week, a lecture was given by Professor Harold A. Wilson, F.R.S., of King's College, on the subject of the "Electrical Properties of Flame." Perhaps no one in Great Britain has studied this subject more closely than the lecturer; and his investigations occupy an honourable place in the record of modern advances in our knowledge of the constitution of matter.

The lecturer stated that in flames there exist free negative and free positive electricity; that dissociation from molecules to atoms takes place, yielding positive and negative ions. The flames employed to illustrate the lecture were almost exclusively those of coal gas—principally the bunsen form. Using these, he showed that an electric spark passes through flame more readily than through air, in the proportion roughly of 7 to 1. Assuming the approximate temperature of the gas flame to be 2000° C. absolute, and that of the air 286° C. absolute, and disregarding for the moment the difference in density due to the different chemical composition, the density of the flame might be regarded as one-seventh that of the atmosphere. By experiment, it was shown that the spark would pass along a length of flame of 7 inches as against 1 inch of an air gap of normal density, or of 7 inches gap with air of one-seventh that density, in a partially exhausted tube. It would seem, therefore, that in each case the energy of the spark must be such as to break up the molecules of the constituent gases into ions.

By using a long bunsen burner constructed of a brass tube placed horizontally, into which were secured a succession of quartz glass tubes, Professor Wilson illustrated the conductivity of electricity through various lengths of that flame. Using platinum disc electrodes, he showed that the quantity of electricity that passed was proportional to the square of the number of cells that supplied the current; this behaviour being different to the law expressing the passing along a metallic conductor. An ingenious apparatus devised by the lecturer served to show that the products of combustion from a gas-flame carry with them into the atmosphere both positive and negative ionic charges, and that gradually these recombine within about 3 feet over the flame.

It is worthy of note that both Professor C. F. Lorenz, of the Iowa University, and Dr. J. Semenoff, of the University of Paris, have shown that the luminosity of flames can be augmented by passing through them suitable currents of electricity.

Companies and the Franchise.

In the early part of last year, the London County Council instructed the Local Government, Records, and Museums Committee to report as to the prevalence of conditions under which large sections of ratepayers paying rates to considerable amounts are without representation on the various administrative and spending authorities in London. They were also asked to give their view as to the possibility and best method of redressing these anomalies. They have now drawn up their report, and it was presented to the Council at their meeting last week. In order to ascertain the extent to which the conditions mentioned in the reference exist in London, the Statistical Officer (Mr. E. J. Harper) has compiled a return showing the rateable value and percentage of represented property and unrepresented property in the City of London and in each Metropolitan Borough, and giving other information concerning the subject. The total rateable value of the County of London on April 6, 1908, was £44,323,704, of which £14,148,315, or 31·9 per cent., related to property in the occupation of public authorities, companies performing public services, and limited liability companies, institutions, &c., all of which are unrepresented on the several administrative and spending bodies. In the Provinces the proportion of unrepresented property in the year 1906 was: In Liverpool, 32·4 per cent.; in Manchester, 32 per cent.; in Sheffield, 30·1 per cent.; and in Birmingham, 28 per cent. The Committee say it is generally admitted that an anomaly exists, and is becoming increasingly serious; and they deem it desirable that the information which has been collected should be made public. They accordingly recommended that the Statistical Officer's return should be placed on sale; and this was agreed to.

It will doubtless be in the recollection of readers of the "JOURNAL" that at the funeral of the late Sir George Livesey the coffin was received at the gates of the cemetery by Archdeacon Hodges and Canon Hodges, relatives of the deceased. A similar sad duty was discharged by them on the occasion of the interment of Lady Livesey on the 14th ult. We regret to record that one of these reverend gentlemen—Rev. Alfred Hodges—has since died. He was Prebendary of Chichester, and had for 31 years been Vicar of Christ Church, Blacklands, Hastings, with which town he had been identified. He died very suddenly at his vicarage. His brother is the Archdeacon of Sudbury.

MAIN LAYING.

By G. H. M'Cowat, of Glasgow.

[**Abstract of Paper Read, with Report of Discussion, at Meeting of Scottish Junior Gas Association, Western District, Feb. 13.**]

Taking a cursory glance at my subject, it will be noticed that it naturally divides itself into several clearly-defined divisions, viz.: (1) Flying survey and estimates. (2) Detailed survey of route adopted. (3) Preparation of plan and sections. (4) Design of pipes and special castings. (5) Preparation of specification and schedules. (6) Fixing contract. (7) Main laying. (8) Records of work done. (9) Maintenance work. (10) Classification of expenditure. My intention at this time is to deal briefly with item No. 3, and to pass on to items Nos. 7, 8, and 10.

Preparation of Plan and Sections.

The use of a plan and section is often discarded; but in well-regulated operations, it is considered indispensable. On this plan and section is recorded all the information you can gather about sewers, gas and water pipes, cables, branch drains, and old burn courses, from existing records or otherwise. When you have obtained this, you are able to lay down a line for your mains with some confidence; and the number and class of the special castings can be approximately determined. The latter consideration is of some importance, as it enables you to be prepared in advance with the special castings, instead of simply waiting until you require them, and rushing to the foundry with an order, when you should have had them on the ground.

In marking off the line of your main, there are several important points to be kept in view. The first is the question of public convenience. It is unjust to put any hardship upon one or two, or even upon any particular class of individuals, by the execution of work of this kind, work which is meant to supply, in many cases, a district beyond the one in which the individuals who may be the sufferers reside or carry on business. The injury referred to may take the form of diverting regular customers by unnecessary interference with the access to shops or crossing places, or by causing the public to take some other route on account of the usual one being kept dirty or otherwise obstructed by the operations. While it is not a good thing always to impose restrictions which may only prolong the nuisance, yet the work should be conducted in such a manner that, even at extra cost, if this would mitigate the evil, any interference with the rights of individuals and certain classes should be fully considered and reduced to a minimum. This may be secured by careful attention to proper lighting and watching of the operations; by following, where possible, the quieter thoroughfares in towns or villages; by confining the extent of the active work; by removing part or the whole of the excavated material to side streets; and at least seeing that all the surplus excavated stuff is removed immediately after the trench adjoining has been filled up. In certain respects there is more liberty in following country roads. Your work should be conducted systematically—*i.e.*, making the filling-up and replacing of surface materials keep pace with the digging, so that as much of the roadway as possible may be kept open for traffic. For your own benefit, it is only by a rigid adherence to proper method that economy can be secured. Any interference with private property should be made good to the reasonable satisfaction of all parties interested.

Another point in selecting the line more directly concerns ourselves. It may happen that there is no choice of position. Some streets are so well taken up that it is just a case of getting a berth where you can. In such cases, you should pay particular attention to see that you have an outlet for your main. If there is a free choice, however, a position about 6 feet to 6 ft. 6 in. from the kerbstone in streets with a 40-feet roadway is a good one to take up. This follows along outside the usual position of the water service-pipe, and will interfere less with the private connections to same; and also the position named will interfere least with the side branch drains, should there be any buildings along the route. Further, this will keep you clear of all tramway-lines that may in future traverse the same thoroughfares. In country roads, the question of position is more vague. The usual width for turnpike roads between the hedges or fences is 30 feet. According to the Roads and Bridges (Scotland) Act, no building can be erected nearer to the centre-line than 25 feet. This usually develops into a 30-feet roadway and two 10-feet footpaths, so that the hedge is almost on the line of the new kerb. Of course, they can put any buildings as far back as they choose; but such widening of the roadway will assist us. To keep the main clear of prospective tramways, it will be necessary to fix the centre-line of the trench about 5 feet from the hedge, or 10 feet from the centre of the roadway. This has the effect of reversing the usual style of operations. It is customary to have the roadside of the trench kept free for storing the pipes and road-forming material, and to leave a sort of access to the trench. If we adopt the line stated, there will be no room next the hedge for storing the stuff taken from the cut. There is no great hardship involved in this change of procedure, if the pipes are laid alongside before the digging is commenced. In all narrow roads, such as the country roads we are now dealing with, the work is always slightly handicapped for want of space, and operations require to be modified accordingly.

The route and position of the main having been agreed upon, you proceed to notify the various local authorities, usually through the burgh or road surveyor, if the thoroughfare is a public street or country road. In the case of private streets or footpaths, both the owner and occupier should be notified. In all or any of the foregoing cases, a plan may be asked for, as well as the general notice; and such a request is not unreasonable, and should be complied with. If there are no objections raised by any of the parties interested, or having overcome any that may have been raised, you are now in a position to start the digging. When the pipes and special castings are ready, and the requisite number laid down alongside the track, you begin by marking off the centre-line of the trench. Before commencing the digging, however, it is necessary to see that you have a sufficient stock of pipes and special castings laid down to ensure continuous working. This is of more importance if the digging and refilling is in the hands of an outside contractor, as any delay may provide grounds for claims for extras, as well as raise other troublesome questions.

Preparing the Trench.

The first step after marking off the centre-line of the trench is to carefully remove the road-forming material, which must not be allowed to get mixed up with the ordinary digging from the trench. In the case of metal and bottoming, it is simply placed on one side; but with causeway, more care requires to be taken. All the stones for causeway are carefully gauged as regards width and depth; and if waste is to be avoided, you must endeavour to so arrange the stones on the bank that they may be replaced in the position in which they were found. One point of importance which cannot be too strongly emphasized is to avoid disturbing the surface of the road beyond what is absolutely necessary. There is no advantage in hampering yourself; but it is bad policy to allow the track to be cut irregularly or wider than is requisite, or not to take the proper precautions to shore the trench to prevent slips, merely to save the little outlay for timber. It is usual to place the road-forming material on one side of the trench and the earth on the other; but space should be left along both sides of the trench for placing and working the sheerlegs and for the convenience of the workmen. About 3 feet is required for this purpose. The trench should be 9 inches wider than the outside diameter of the pipe at the bottom, with enlargements at sockets to allow the pipes to be jointed with freedom. In fixing the width of the trench, the contingency of requiring to use timber should always be kept in view. This might arise without sufficient warning; and to widen out the trench after having started it too narrow is slow and expensive work. Where no timber is used, the sides should have a batter or slope of about one-quarter foot horizontal to one foot vertical. If the sides will not stand to this slope, it is cheaper to resort to the use of timber than incur the expense of removing the additional stuff from the trench. The depth of the trench varies according to the size of the main; the usual cover allowed being 3 feet. But there are special circumstances where it will be advantageous to increase the cover, such as working against an adverse gradient in endeavouring to save the use of a syphon. The least cover possible should be given to pipes in districts undermined with coal workings, so as to lessen the weight resting on the pipe in the event of their support yielding, and incidentally make them more accessible for repairs.

In no event should more than 120 yards of the trench be operated upon at one time; and the work should be properly allocated. In cases where the banks are troublesome, the shorter you can keep the trench open the better. In dealing with the water in the trench, you should not attempt to lower the level any more than is necessary. It is better to provide water-boots and let the men work in it, so long as it does not seriously inconvenience them; for the higher the level in the trench, the better will the scouring action of the water outside be neutralized.

It sometimes happens that the surface cannot be broken, as in the case of crossing tramways, canals, or railway embankments. The work is then done in tunnel. So far as I am concerned, the work of this class is of the simplest kind; the greatest part of the trouble arising from handling heavy pipes. The smallest space for working with men and hutches is about 3 ft. 6 in. wide by 4 feet high. If the line is straight, there is no difficulty in laying it off; and if the operations can be conducted from both ends, this, unless shafts are necessary, will expedite the work considerably. When the stuff through which we are cutting is compact and reliable, our work will be still further simplified. Should the material be other than reliable, it will take all the care and caution we can exercise to carry the work through successfully. In very bad material it may be necessary to work under air pressure. In such circumstances the tunnel will require to be larger and lined in some permanent manner—say, with cast-iron segments. If the stuff is of the worst description, a shield may be required to prevent the face bursting in upon you; but where this is necessary, the progress is usually very slow.

The work of timbering the trench requires some skill. It is usually given into the hands of the more experienced men; and it is of considerable importance how the man relegated to the work discharges this duty. The main point in using timber for temporary purposes especially lies in the fact that it is not so much the permanent strength of the material used, as the manner in which it is applied. In some circumstances, it is not only waste of time and trouble to employ heavier timber than is necessary, but you might possibly have been better without it, particularly in open loose ground; the reason being that, if too heavy, it will not adapt itself to the irregularities of the work, and instead

of serving the purpose for which it was intended it might conceal the gradual wearing away of the banks. For occasional supports, all that is necessary are two uprights—one on each side—tightly held in position by cross-pieces called rances. These can be placed as close as you like, and may be taken out one at a time to admit of lowering the pipes into position. They are principally used in running alongside an adjoining trench when the material is of a compact nature. In open loose ground of a gravelly nature, or where the strata are charged with water, the timbering takes a different form. We then require what is called close sheeting, instead of occasional shoring. It consists of flooring boards about 1½ inches thick by 9 inches broad, placed against the banks behind wales 3 inches thick by 9 or 12 inches broad—the whole tightly held in position by means of the rances, with the addition of wedges to tighten up in the event of any yielding. The rances may be round or square, but are more frequently of the same section as the wales. The wales are placed about 3 feet apart, measuring vertically, while the rances are spaced from 4 to 6 feet apart, depending upon the work they have to do. The wales with rances are first placed in position, and the polling boards slipped behind the wales and driven down with a mallet, bit by bit, as the excavation proceeds. Where the material is of a fine nature, and the force of water strong and troublesome to the extent of bringing the material with it, then the joints between the polling boards should be packed with straw or horse dung to act as a filter.

The timbering we have been dealing with applies only to open cast work. When we have to carry on our work in tunnel, timbering, with very few exceptions, is always necessary. The type of timbering employed in this class of work is very simple, consisting of a cross-head supported on two uprights called legs, which have a small sole-piece for a foundation. These are placed from 4 to 5 feet, with an intermediate support where necessary; while behind them, arranged longitudinally, are placed the polling boards of similar section to those used for sheeting the trench in open cast.

Generally, the parts of your track requiring the greatest attention are the crossings of roads. At such places, you may have pipes, tramways, &c., which, if running parallel, are comparatively easy to deal with. But when they are found crossing the track, they require special consideration; and, unless they have been anticipated and properly prepared for, they will entail delay. In some cases where tunnelling is required on account of tramways or some other special reason, the part may be left out until the whole work is finished, and then treated by itself. When, however, proper provision has been made for dealing with such cases by the preparation of enlarged drawings, showing the different features in detail, and allowing for the special castings being ordered and provided in plenty of time, there is no reason why the work should not go on continuously without interruption. Another feature of the work is to be found in the recurring changes in the stuff we have got to deal with in our trench. If you are at all curious, you will find plenty to stir an inquiring mind; for, even within such limits as a pipe trench, you will be surprised at the variety of phonomena presented to you. It is in the course of laying the main that the occurrence of any special features should be noted, as they may assist in depriving of its secret some mysterious happening to your pipe, and be of considerable value in helping you out of an awkward dilemma. They may also furnish at some future time valuable aid in determining the actual or real life of the pipe. Whatever importance we may be disposed to attach to the future effect of the strata through which we are passing, we cannot escape the immediate question of how to deal with them as they assist or impede progress.

In removing the loose material, there is nothing to take up our attention beyond the precautions applying to the timbering. The work of cutting out plastic clay is a job after the labourer's own heart. He is in his element in anything that gives constant mechanical employment without the necessity of putting too severe a strain upon his brain power. The operations in this plastic clay are otherwise of the simplest description; for, owing to its usually stable nature, you can dispense with the aid of timber. In boulder clay, however, the positions are entirely changed. I do not think there is any more irritating material to remove than this. It is of a hard, compact nature, full of boulders of different sizes. It will neither pick nor cut with the spade, and the most satisfactory method I have seen adopted for disposing of it is by the use of a light charge of explosive. After being dislodged or loosened, it can be broken up and handled in lumps, as you do with stones.

With rock cutting in our work we are at a disadvantage, in view of the restrictions placed upon us in the use of explosives, especially in the vicinity of dwelling-houses. When explosives are used, it is merely for the purpose of loosening the material to make it suitable for operating upon with wedges and picks. In the case of unstratified or igneous rocks, such as whinstone, the use of an explosive is unavoidable. Some of the rocks belonging to the stratified class, such as a bastard freestone, are not much less tractable, and, if they are of the real sort, will not yield to any other treatment. In most of the stratified rocks the wedge can be used very effectively, provided you get it in the line of stratification. In liver rock, however, this is not so easily found; but, by simply exposing a fresh surface, you can discern the reed of the stone, and be able to tackle it to advantage. The restrictions against blasting which apply to open cast work, can be removed when the material we are dealing with occurs in tunnelling operations. The usual method adopted is to jumper the holes by hand, and fire the charge by the time-fuse. When rock is met with in the trench, the excavation is usually taken out 6 inches deeper, to make room for some soft material to form a bed for the pipes. It is a mistake to remove any more rock than is necessary; and, though this is hard to regulate, yet, in all contract work, a limiting allowance is fixed—namely, that the width of the trench at the bottom shall not exceed by 9 inches the internal diameter of the pipe, and the sides to slope outwards at the rate ¼ foot horizontal to 1 foot vertical.

Assuming that we have reached the bottom of the trench, our next concern is its condition for affording efficient support for the pipes. If the material is firm or compact, offering good support, there will be no further trouble here; but if it is not reliable, then it is essential that it should be made so beyond a doubt. The bed must be as uniform as possible—that is, it must not be hard at intervals with soft patches intervening. In such circumstances timber, and sometimes concrete, is used to bridge over the soft places. I might mention here that the great principle in construction—namely, to make your structure as light as possible, consistent with the desired strength, and also to spread the weight over as large an area as possible—is as applicable to this class of work as to any other. Hence, using such material as concrete, it is no advantage to have it composed of the heaviest materials you can get, like whin metal. A good concrete for this purpose can be made from hard burned engine ashes, mixed in the proportion of one part of good cement to four parts of ashes. In soft, wet ground this concrete should be placed in position dry, without the customary admixture of water. A layer of such concrete 12 inches deep will, when set, meet the heaviest requirements. If the ground is not too soft, timber is sometimes used in the form of slabs—the object being to spread the weight of the pipe over as large an area as possible. In a soft, muddy bottom, if the firmer material, which is usually clay, is not far distant, another way of getting the necessary support for the pipe is by simply filling up the bottom with stones to the requisite level. Any kind of hard material will serve the purpose. If it were not for the chemicals in ashes, nothing better could be used. In cases where the cutting is in peat, and the bottom of the peat layer lower than the bed of the pipe, it is sometimes cut out to the full depth, and firmer material put in its stead. Stones may be used here in filling up, and also timber, if the peat is not disturbed beyond the bed of the trench. When concrete is used, the trench must be dug out to the extra depth, not only to accommodate the concrete, but also to allow for some fine material to bed the pipe upon, the same as for rock.

Pipe Laying.

Pipe laying is not difficult work, but demands care. The usual practice in forming the bottom of the trench is to keep parallel with the surface of the road where the contour of the road is of such an inclination as to give sufficient fall to drain any condensation that may take place in the pipes. In certain cases, however, the fall of the surface is not sufficient; and in some instances it may be reversed. Further, it may occasionally be advantageous to incur a little deeper cutting for a short distance, if, by doing so, we may be able to dispense with the use of a syphon. That this is worth aiming at stands without question, especially as the main increases in diameter. To so arrange the fall of the main as to avoid the use of syphons where these can possibly be dispensed with, is one of the chief uses of the section mentioned at the beginning. To enable us to fix the inclination of the main, the question of the minimum fall arises. There is a wide divergence of opinion about this. I have heard it laid down by an eminent engineer that ⅛ inch per 12 feet length was sufficient; while another authority laid it down at 1 inch per 12 feet length. In settling this point, you must bear in mind that you are not dealing with gas laden with particles of tar, such as you have in the works, but with the purified article. That being so, I think 1 inch too much; but, on the other hand, while ⅛ inch may be quite sufficient to drain the pipe, it is a very fine quantity to give to workmen to set off. To my mind, ¼ inch is as little as you may expect men to deal with; and, after all, it is not an excessive allowance.

For the purpose of giving pipes the required fall, a straight-edge or rule with a nail screwed into one end of it is used. The rule should approximately be the length of the pipe from the face of one socket to the neck of the other, and, when in use, the nail should be at the low end. In following the inclination of the road, if the track is on the straight or a flat curve, it is better to use borning rods instead of using the straight-edge on the inside run of the pipe. The borning rods are applied to the top or outside of the pipe, and can be sighted by the foreman, who has thus complete control of an important part of the work without having to descend into the bottom of the trench or depend entirely upon the men. Every care should be taken to ensure that the pipe is bearing upon the solid ground throughout its entire length; and any carelessness in digging out material in excess of what is actually required and necessitating replacing it with soft stuff, should be severely reprimanded. It is most essential that the bearing offered to the pipes should be uniform; and this cannot be so when the material is put back loose, even when beaten. All pipes before leaving the bank should be thoroughly rapped, especially at the spigot end, to detect any splits. When the pipes being laid have plain joints, the spigot of the one is simply placed inside the socket of the other. If the spigot has a bead cast upon it, this will assist in centering the pipes; but, if not, a piece of rope

yarn must be used for the purpose. In all plain joints where rope yarn is used, it is necessary that this should be well hammered in, and not merely jammed in with the chisel. Where half or full turned and bored pipes are used, the machined parts should be carefully cleaned with a piece of waste preparatory to giving them a coat of good, red lead or some other anti-corrosive paint. When laying, each succeeding pipe drives home the preceding one. A piece of wood is placed in front of the socket of the pipe being driven home, while the last pipe lowered into the trench is allowed to swing from the sheerlegs against it for that purpose. With small pipes where no sheerlegs are used, a mallet is employed to drive them home. To get the best work, the pipes should be laid straight end-on to one another; but if care be exercised, a little liberty can be taken in deviating from the straight line to follow a flat curve. Where a slight angle in the track occurs, the object should be to spread the effect over several joints. This can be done by keeping the spigot hard up at one side of the socket, and leaving a gap about 1-36th of the diameter on the other side. If the space is formed in the bottom part of the socket, similar to that occurring when changing the gradient of the pipe, it should be filled up with cement to prevent the lodgment of liquor.

Before proceeding to stave any joints, the pipes should be thoroughly haunched with the finest of the material from the trench; the object being to ensure that the pipes are tightly held in position. Of course, we must leave sufficient space at either end to allow of staving the joint at least 36 inches in front of the socket. In running a lead joint, clay is used for pipes under 10 inches diameter, in place of metal clips for pipes of larger size. There is a special art in shaping the clays and also placing them. It is not of much use having extra lead on the bottom of the joint, as owing to its position it is not possible to make the most of it. In consequence, the clay is kept close in on the under side of the socket, and gradually widens out as you come upwards, so as to give more space for lead at the parts where you can use it with effect. If for some special reason you wish more lead (say) to fill a plain socket, without the use of yarn—a man who has practised at the work can with advantage apply a flat clay, instead of the round one. The iron clips in use should be rounded in order to represent the round form of the clay. This will give the necessary space for the surplus lead you rely upon to make up for shrinkage when the lead has cooled. The formation of the gate in the clay or clips where the lead is poured into the socket should not be overlooked. If too small it will choke and interfere with the access of the lead into the socket. The preparation of the lead has its importance also.

When the socket is filled, the lead should be allowed to cool thoroughly before any attempt is made to stave-up the joints. When staving operations commence, the man should tackle the under side of the joint first. The larger the size of pipe, the more important this is, because the difficulty in getting at the under side increases, and the man needs all the strength of a fresh start that he can command to overcome the difficulties of the situation. When the lead has been gathered up in the bottom, and the various sets used, you work up both sides and finish off by driving home the lead at the gate. This is the part you rely upon for tightening up the whole joint. You cut off what you consider surplus lead, only leaving sufficient to perform the finishing touch. Care should be taken that the socket is not damaged by attempting too much. Cements have been used in some places for jointing pipes; but they should be adopted with care, for unless the situation is free from vibration, and the utmost care taken to make the pipe secure against any movement with the haunching, the slightest change in position will nullify all your efforts to produce a reliable joint. The newer material in the shape of lead wool seems to have some promise; but as yet insufficient time has elapsed to enable one to pronounce a definite opinion upon its merits, other than its handiness in repairing leakages.

In tunnelling or places where liberty is restricted, flanged joints are used. If the faces are machined, they can be coated with white lead and screwed up. If not machined, a layer of millboard steeped in hot water and coated with white lead is placed between the flanges to take up any irregularities in them before proceeding to tighten up. In using special castings, as little cutting as possible should be indulged in. It is usual in work of some extent to classify the bends under fixed sizes. All bends when ordered on this plan are usually kept flatter than is wanted to exactly suit the corner; and the necessary play to complete the turn is borrowed from the joint. In placing valves of the rack-and-pinion type, the spindle of the valve should be kept on the one side of the trench, so that it can be used as a means of indicating the position of the pipe at any time that this should be required. One precaution that should not be overlooked is the proper closing of the socket of the pipe when work is suspended for any interval, no matter how short. A wooden plug is used for short intervals; but for any protracted delay in resuming operations, an iron plug should be employed.

My remarks have principally dealt with the laying and jointing of cast-iron pipes. Nowadays the use of steel tubes is becoming more common; but generally the remarks applying to the laying and jointing of cast-iron pipes apply equally well to steel tubes—that is, when the latter are supplied with some protective coating. If the tubes are to be coated when they arrive on the ground, this is where the only extra trouble may come in. If not protected by canvas or other fixed coating, they should be securely packed in clay. This question of coating steel work for underground use has not been satisfactorily solved. Apart from the durability of the substances used, we have still the question of vulnerability to be considered. At present a very slight accidental cut from the labourer's pick might completely destroy their usefulness. What is wanted is something after the tried method of boxing and pitching, where some warning might be given of the existence of such work before the actual damage is done; while the pitching would be specially valuable as an additional safeguard in the event of troubles from electrolysis becoming acute.

Assuming that the pipes have been securely packed with fine dry material—and insistence on this cannot be too exacting—the filling then proceeds in regular layers, taking care to select the finer material for placing next the pipes, and at the same time applying a suitably loaded beater to assist in compacting the material. Any stones or boulders should be laid aside from the finer material until the trench is almost finished, when they should be placed on the surface to act as bottoming. If you wish to add to the effect of beating, water is in some cases used, but never on any account where clay is the material you are dealing with. Clay has not only the power of absorbing, but also of holding, quantities of water. In this state it loses its supporting power; and anything placed upon it is simply absorbed, while any attempts to beat it are farcical. Clay in this condition gives most trouble when we reach the surface and come to restore the road-forming materials. I have seen attempts made to combat this trouble by placing additional bottoming under the metal or ashes. Such a move was only aggravating the trouble; for the water will soon find its way through the loose material on the surface, and will lodge among the interstices ready to be taken up by the clay. The chief objects to be aimed at in road construction are to keep the foundation dry, and to form the surface in such a manner that the water will be directed into channels prepared to convey it to the sewers as quickly as possible. The most effective way of coping with such a situation is to keep the refilling at least 12 inches lower than the formation level of the road, and to substitute for the removed clay filling, hard burned engine ashes. Where the banks have been troublesome and timber used, you should consider carefully any instructions you may give as to the withdrawal of the timber. Unless in very bad cases, it is rarely necessary to leave in close sheeting; but a shore every pipe length, or even a setting including wales and uprights at the rances, should not be grudged where the circumstances indicate risk of future damage to adjoining pipes or road surface. In packing pipes in tunnel, the difficulty arises from inability to replace the material in a compact manner, should it be of a loose nature. The best material for this purpose, where brick and mortar packing is too expensive, is clay in a moderately dry condition.

The restoration of the road-forming material, in the first instance, is more or less of a temporary nature, as, until the time allowed for the complete settlement of the trench—usually twelve months—has elapsed, it is not advisable to attempt to permanently restore the surface of the road. In restoring the metal and bottoming, proper allowance has to be made for subsequent settling; and, consequently, the bottoming on the trench is kept higher than the adjacent material. You cannot make a hard-and-fast allowance for this, as a great deals depends upon the nature and the trouble taken to compact the materials we are dealing with. The bottom will eventually sink about 1 inch per foot of depth of trench by the time the road-roller has finished its work. You can hardly place the bottoming as high as you would wish in order to allow for this subsequent settling, as there would be no space left for the metal without raising the surface of the road where the track is to such an extent that no traffic would use it. It is better to keep the bottoming down to allow of a portion of the metal being spread, and to make arrangements for the remainder being spread as the trench settles. The bottoming is rarely disturbed after being laid, unless some very bad bit of work discloses itself. It is therefore of importance that as good a job as possible should be made of it. If the consolidating of the material and the replacing of the bottoming have had their proper share of attention, a considerable sum will be saved in not requiring to provide new metal to fill up depressions caused by defective work. The road metal is the material to aim at saving. In replacing bottoming, the stones should be set perpendicularly with the broad surface downwards, and as close as they can be laid. The uneven tops are levelled off by filling up the intervening spaces with smaller stones; the whole being blinded with ashes or shivers. This gives it a thoroughly compact foundation to support the metal, which should then be placed upon it in layers as required. In the temporary restoration of causeway sets, they are generally laid upon a bed of ashes about 2 inches deep, and periodically repaired as occasion requires. In case of tracks where the surface is formed of granolithic or some patent smooth paving materials which you cannot replace unless with fresh material, it is advisable to finish off your track temporarily with a layer of ashes.

I have frequently referred to the attention that ought to be given to cutting the trench for the preservation of the surface of the street. You will now be better able to see and appreciate the importance of what is involved. To emphasize the point, I will give the approximate cost of some of the various forms of street formation, and, alongside, the cost of digging and refilling the trench, including the temporary repair of the road surface.

The table (on p. 542) is based upon the quantity required for a 24-inch diameter pipe, where you have roughly a square yard per running yard, and the average depth of the trench is 5 feet. The

Nature of Road Surface.	Cost of Permanent Repairs.	Cost of Cutting Trench, with Temporary Repair of Surface.
	s. d.	s. d.
Metal roadway with handset bottoming	2 0	.. 3 6
Square dressed whin causeway with concrete bed and grouted with asphalte	5 6	.. 4 9
Rubble causeway and handset bottoming	1 6	.. 4 0
Smooth paving, alcatraz, with concrete bed	12 6	.. 4 6
Smooth paving, tar macadam, and handset bottoming	5 6	.. 4 0
Granolithic with concrete bottoming.	3 9	.. 4 0

allowance for timber left in the trench after use for shoring is usually about 1s. 6d. per cubic foot; and, assuming one shore to the pipe sufficient, the rate for digging and refilling in each case would be increased by 9d. per lineal yard.

Expelling the Air.

When the main has been laid through and through with the exception of two gaps (one at each end), the next operation is that of expelling the air from the new pipe. Previous to this being done, however, the necessary tees or crosses required to form the connections with the existing mains should be in position. In placing the tees or crosses, a piece of plain pipe should be added to allow of the gas being blocked, when the time arrives for joining up the new pipe, without interfering with the flow of gas in the existing main. As this work is quite independent of the laying of the new pipe, it can be undertaken when the time suits best for doing it. Being now ready for joining up the new to the old work, the gas is first blocked clear of the existing main at both ends, and the cap or plug at the lower connection is removed when the new and old pipes are connected. The bladder here is then removed, and the hole in the pipe plugged; and the gas is allowed to travel towards the higher end, expelling the air as it goes. At the upper end you wait until you are satisfied that the mixture escaping is harmless—that is, that it will not affect the illuminating power of the gas or be a source of danger. When you are satisfied as to the mixture, the two pipes are joined up and the bladder removed.

Records.

In conducting work of this kind, which is entirely concealed when completed, you cannot have too many notes. You will not be long before you are inundated with complaints about interference with drains, sewers, pipes, and other property, and even to the extent of interfering with the waterway of burn courses. It is really astonishing how many things may appear to go wrong at such a time; and if you cannot assure the complainants in an emphatic manner that whatever is wrong is not due to your operations, you may make up your mind for considerable annoyance. To protect yourself in such cases, and also for future reference to the work, you should keep a journal of the daily progress, giving complete information as to the course of your own work, and also as to the condition in which you found any private or public property that may be interfered with by the new main, and the manner in which you have restored it.

There is a great amount of useful information to be derived from such a journal of progress, if properly arranged like the following: A column for date. A column, of good width, to contain a rough sketch plan showing the position of the main and the locality, also a section giving the depth of the main and forming a record of the depths of rock cutting, concrete, timbering, or other special work—such as showing interference with sewers, road, or railway arches. Another column for the length of trench dug; and one for the length filled in. A column should be provided for the number of pipes laid down and jointed, with materials used; one for the number of men employed of the different classes; and a final column for remarks or sketches dealing with special features of the work in detail. The record could be further elaborated if desired; but, as noted, you may think it complete enough to keep up. One hour a day, however, spent on the job with a fairly intelligent man who can sketch a little, is all that is required. In the better conducted or larger concerns, a set of Ordnance Survey maps of the gas area are kept, and all the information relating to the position of the main is transferred from such records to them for general reference. In the larger towns, by contributing to the additional cost of their preparation, an issue of fairly large-scale maps is available. Maps, however, have shortcomings which cannot be met unless supplemented by such a record as indicated.

Classification of Expenditure.

Everyone in charge of this work must be prepared, when appealed to, to decide or classify the expenditure. All expenditure falls under two great divisions—capital and revenue. The moneys treated under these two heads are spent on new work, renewals, repairs, and sundry debtors account. A new main is one entirely additional to the system, and is classified as capital expenditure. Renewals are the enlargements of old mains, and are charged partly to capital and partly to revenue. Special repairs may require special allocations; but ordinary repairs are entirely charged to revenue. In sundry debtors work, which includes work done for private parties or public companies, the amount is first charged to capital, and afterwards recovered. Expenses of the work require some manipulation before appearing in the final form. The squad foreman has his weekly time-book that he fills up daily. This book is handed into the office, with a note of all materials used and their application, specified under the different heads. The clerk has two days generally in which to collect the time and classify the different grades of workmen. The process here takes different forms. Sometimes a time-book is kept in addition to a pay-book; but in smaller concerns, the time-book, other than the foreman's or timekeeper's, is dispensed with. Each man's time is classified according to the divisions—new mains, renewals, repairs, and sundry debtors. In some cases, the man's time is charged direct to special columns in the book, under the headings stated; in others, the different workmen are classified in groups, and an abstract of the various divisions of expenditure is made afterwards. The first method involves a larger number of calculations, and takes up a great deal of space needlessly, and does not give the same facilities as does the latter plan of collecting expenditure on individual jobs.

In allocating the cost of the work to the several divisions, some difficulty may occur as to what is capital and what is revenue. Regarding new work, this is comparatively simple. If the new main is entirely additional to the system, all the time from the minute you put a tool into the ground until the time the surface is restored to the satisfaction of the various parties interested, and all materials used on the work, should be charged to capital. Any crossings or connections up to the point where they reach an existing main are also charged to capital. Renewals of existing mains are charged partly to capital and partly to revenue—the part corresponding to the size of the old mains displaced going to revenue, while the portion relative to the increased size is charged to capital. All repairs and alterations to existing mains which do not increase their value are a revenue charge. Those carried out to facilitate the laying of a new main are a capital charge. The expenses of the general staff should be allocated, and the respective shares charged to different divisions accordingly.

Discussion.

Mr. J. F. Harrison (Glasgow) described the paper as a very interesting one, but, from its length, one which was difficult to discuss. The subject had been dealt with very thoroughly. One of the points which struck him was that of the deviation from the straight line. The maximum stated for a 36-inch pipe was 1 inch, and 1-6th inch for a 6-inch pipe. He should have thought that it would have been in inverse ratio. In staving-up pipes, they were entirely dependent on a hand process. Pneumatic riveters were used for other work. The plant for doing this work was very compact; and he did not see why they could not use something of the same kind for pipes. It would not be difficult to rig up a small pneumatic plant; and the caulking would proceed more quickly, and be better done, than by the arduous process of the workman creeping under the main and lying on his back. He had hoped to hear something about main laying for long distances; but probably at some future time Mr. M'Cowat would give them a paper on this most interesting subject. They were gradually being crowded out of the streets; and it was necessary sometimes to make long detours. He would have liked Mr. M'Cowat to have said something about the distribution of gas under high pressure. They found pressures up to 45 inches on the Continent; and it did not seem to cause deterioration of the gas, as might be expected, or reduce its calorific value.

Mr. P. M'Dougall (Helensburgh) said in his opinion the paper would appeal more to the managers of the larger distributing stations than to those working in country towns, because the latter did not have a great network of pipes to contend with. In laying mains, they had to provide for the heaviest traffic that was likely to pass over them; and he did not consider he was exaggerating when he said that the majority of broken mains were caused by the steam road-roller. To his mind, a hard-and-fast rule could not be laid down as to the depth of a main, because this would depend, to some extent, on its position. He believed that to lay at from 2 feet to 2 ft. 6 in. was the general practice, though he knew of a case where a burgh engineer insisted upon 3 ft. 6 in. By section 9 of the Gas-Works Clauses Act, 1847, the road authorities could insist on having a plan of the proposed main furnished to them, as mentioned by the author of the paper. It was obvious that their purpose in insisting upon a main being laid at a depth of 3 or 4 feet was to prevent fracture by the road-roller. He thought, however, it had been proved by Mr. Herring, of Edinburgh, and other eminent gas engineers, that the depth at which a main should be laid was not the most potent factor in preventing fracture, but the manner in which it was laid, as Mr. M'Cowat had pointed out. It really depended more upon how the trench was formed, so as to have the pipe resting upon a good foundation and be well rammed in. He had been working upon pipe tracks where one or two men received a little addition to their wages because they were better up to the bottoming of the track than were the others. He considered this was money well spent, because by good levelling of the track there would be less liability to subsidence. He had expected that Mr. M'Cowat would have dealt with main laying for high-pressure gas, because this subject had of late been occupying the minds of gas managers.

Mr. R. A. Campbell (Glasgow) said he agreed with the author of the paper as to the preparation of a plan and section; and on no account should work be begun until this was done. Otherwise during its progress endless trouble would be caused. Supposing, for instance, a pipe was laid in the centre of a street, and some years afterwards a tramway system was introduced over the pipe,

and then a breakage occurred. How were they to get at the pipe to repair the damage? Every precaution should be taken, and every forethought exercised, to fix the line of the pipe so that at no future time should it interfere with the work of other departments. He thought it was always advisable, when putting down pipes, to lay at least six in the track, and get them in correct line and level, before any of the joints were made. This enabled them to get a better line and gradient on the pipe. Instead of Mr. M'Cowat's method of keeping a record in book form, he preferred to have all the information put down on the plan and section, as the work proceeded. This information might include sewer pipes, and any other *impedimenta* met with; and the information could be referred to at any time, just as if it were in book form. High-pressure gas distribution had been mentioned. His opinion was that if high pressure were adopted in Glasgow, one of the effects would be a great increase in unaccounted-for gas, because the gas at the works would be registered at ordinary pressure, and as soon as it got into the mains it would be under high pressure, and would consequently be squeezed into smaller bulk.

Mr. A. KELLOCK (Alloa) said that during the past winter they had had great complaints in his town with regard to the pressure in an outlying district, about three miles from the works, as they were only getting 17-10ths. This was a serious complaint, and it had to be faced boldly. Looking on all sides of the question, they thought it would be advisable to have high-pressure plant; and they put in a Bryan Donkin compressor, with an electric motor. This gave a pressure of 6½ inches at the works; and at two miles distant they were able to get 4½ inches. This was rather high; and so they put near the beginning of the district a service governor, which reduced the pressure to 3 inches. By this means, they had been able to stop all complaints with regard to want of gas. During the three months the plant had been in use, it had given satisfaction, and worked very smoothly.

The PRESIDENT (Mr. A. H. Whitelaw) proposed a hearty vote of thanks to Mr. M'Cowat for his paper; saying he was sure the members would agree that he deserved this, when they considered the amount of real work he had put into it. He did not think they could expect that in one paper the author could deal with the whole work of main-laying, for it was an impossibility. There was material for twelve papers on this subject alone, without considering distribution at all. The points Mr. M'Cowat indicated, but had not dwelt upon, would form subjects for future papers. He (the President) knew that Mr. M'Cowat was able to speak upon any of these subjects; and it would be to the advantage of the Association if they could induce him to come forward with other papers upon some of them. Referring to the remarks on the paper, he did not see any difference between the laying of high-pressure and low-pressure mains. High-pressure distribution was, he believed, a thing of the future—not, perhaps, in the immediate future—in Glasgow. But it was being dealt with in other places; and it would have to be considered.

Mr. M'COWAT, responding to the specially hearty vote of thanks which was accorded to him, said he appreciated it very much. It was an agreeable surprise to him to find his subject having so much interest evinced in it, because it was one which he had always regarded as being beneath the notice of people generally. If he had carried out the original scheme of his paper, he would have worked up the matter of interest and sinking fund charges, which were important items in the consideration of main-laying questions. There was nothing whatever in the present system of main-laying, if properly carried out, to prevent higher pressure than those now in use. Unaccounted-for gas was principally due to broken pipes and drawn joints, which, again, were due to defective work in the digging of the trenches. If they did not take precautions to protect the pipe from drawing, this was where the defect came in. If attention were paid to the packing of the pipe when laying, there would be no difficulty whatever in carrying gas at high pressure. He thought the speakers had supplemented the material he had given; and he did not think he could carry it any farther.

Society of Engineers.—At the meeting of the Society at the Royal United Service Institution next Monday, Dr. J. S. Owens will read a paper in which he will describe a new test devised to determine whether or not concrete is properly mixed; and, in the case of a mixer, the minimum time required to mix. The laxity of specifications and practice will be dealt with, and the tests carried out for the same purpose in the past will be described. A description of actual tests of machine and hand mixed concrete will also be given.

"Gas World" Analyses of Municipal Gas Accounts.—We have received from the Publishers (Messrs. John Allan and Co., No. 8, Bouverie Street, E.C.) a copy of the above-named work, which is now issued separately from the "Analyses of Gas Companies' Accounts." The annual accounts of 69 municipal authorities for the year 1907-8 are dealt with; all the items of revenue and expenditure being worked out at per 1000 cubic feet of gas sold. The makes of gas of the several undertakings range from 42 to upwards of 7000 million cubic feet; so that managers of works not included may easily select for comparison others which are similar in capacity to their own. The analyses are contained, as before, in two folding canvas-backed sheets; and the undertakings are divided by blue lines into groups of three, thereby facilitating reference. The price of the work is 10s. 6d. net, post free.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

First Annual Dinner.

This session, the Council of the London and Southern District Junior Gas Association have added a new item to their programme in the shape of an annual dinner. This took place on Saturday evening, at the Horse Shoe Hotel, Tottenham Court Road; and the success which attended it was such as to leave no reason for doubt that it will prove the forerunner of a series of similar functions. About fifty sat down, among them being one of the honorary members, Mr. E. Pilbrow; and in view of the pleasant time that was spent, we shall expect to see a still larger muster on the next occasion. The President of the Association, Mr. W. J. Liberty, was in the chair.

Among the varied programme of music, song, conjuring, and recitation, a few brief speeches were interspersed. The President, after the Loyal Toast had been duly honoured, proposed "The London and Southern District Junior Gas Association," and, in doing so, remarked that it was a great pleasure to him to be in the chair on the occasion of the first of the Association's gatherings of this kind. He had been asked how the Association managed to get through so much work; and, in reply, he said it was due to three things. First, they had the vigour of youth—which meant work. Then they had enthusiasm—which meant ideals, and was a great asset to any organization. Thirdly, as juniors they had much to learn, and were desirous of improving their positions. The Association had proved very helpful to him; and he believed this had also been the experience of others. The programmes had been attractive, varied, and essentially educational. In conclusion, he coupled with the toast the name of Mr. W. Upton, who for two years had occupied the position of President, and had done much for the Association in its early and more feeble days. Mr. Upton, in responding, said that, as far as work was concerned, he thought they had shown up well when compared with the other Junior Associations; and plans were frequently considered by the Council for increasing the usefulness of the Association, whose success he had much at heart. What he had done it had been a pleasure for him to do. Mr. D. W. Winslow, proposing "The President," congratulated the members on having such a man as Mr. Liberty at their head. He had had great experience, and had been helpful to them in many ways. The President, in reply, remarked that he could not say he was satisfied with the way he had carried out the duties of the office with which he had been entrusted. He could assert, however, that the members had rallied round him in a marvellous manner, and that the Council had acted as one man during the year. The Association also owed much to the Hon. Secretary (Mr. J. G. Clark), who during the past three years had worked hard for them.

Before separating, due acknowledgment was made of the services of the Stewards (Messrs. H. Rothwell and P. Smithers) and of all those who had contributed to the evening's programme.

A meeting of the Association will be held next Friday evening, at the Cripplegate Institute, when a lecture will be given by Dr. Samuel Rideal on "The Hygiene of Gas Lighting." The lecture, which will begin at 7.45, will be illustrated by lantern slides. At its conclusion, a special business meeting will be held for the discussion of the rules.

The North-East Lincolnshire Water Company Again.

The North-East Lincolnshire Water Company are after money once more. This time they are offering for sale at par £3000 in ordinary shares of £10 each, which shows that the previous appeal did not bear much fruit—if any. There are doubts on the last point, as in December £4710 ordinary shares of £10 each were offered, and then it was said that the whole of the capital had been issued with the exception of 500 ordinary shares. The same statement again appears. But then it was also mentioned in one place that the ordinary shares were only entitled to a maximum dividend of 7 per cent.; in other places to 10 per cent. In this respect the present invitation has been revised, by deleting the contradictory statement as to 7 per cent. On this occasion, however, it is declared that the authorized capital of the Company is £36,000—£21,000 preference and £15,000 ordinary. In December it was mentioned that the Company's authorized capital was £48,000; the difference this time being accounted for by the omission of the insignificant fact that (according to the last prospectus) there are £12,000 of debentures standing for interest before the preference and ordinary capital. The bait to people of an investing turn of mind is much the same as formerly. "Interest at the rate of 5 per cent. per annum on the amount of shares applied for is guaranteed for a period of two years, from September 29 last." It was three years on the last occasion. "A full six months' interest will be paid on March 25 next upon the amount of shares purchased." The sound and progressive nature and the increase in capital value of this class of investment are said to be well known. Of course, a "class" of investment may be divided into good and bad; and we should be very careful, consulting our own interests as investors, not to over-rate the Company by putting it in the former category. But further particulars as to the anxiety of the Company to get hold of money may be obtained from the "JOURNAL" for Nov. 24 and Dec. 22 last.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Railway Demurrage and Siding Rent, &c.

SIR,—I am surprised to see Mr. Keillor's letter in your issue of the 16th inst. The Broughty Ferry Corporation were duly circularized among all others of 50 million cubic feet and upwards production, and a copy of the proceedings of the first conference supplied them. They were also invited to be present at the subsequent meeting, when definite action was taken and representatives appointed to act on behalf of practically the whole of the Scottish gas undertakings. Under date of Feb. 2, Mr. Keillor wrote: "I placed your communication before my Town Council last night, and they are entirely in sympathy with the object of your deliberations." Broughty Ferry were consequently entered on the list as one of the authorities concurring.

Mr. Keillor's letter to you now implies that, while his Corporation concur with the importance of the issues raised, he himself has failed to see their import or to conceive the injury which gas undertakings in Scotland must suffer as a consequence of their imposition. Mr. Keillor is quite justified in holding whatever views he thinks proper; but he should give others credit for being sincere in the views they hold, particularly when they are probably based on a much wider experience and, consequently, a more appreciable knowledge of the complicated circumstances involved. He asks: "Why should the simple imposition of a charge, which on all hands is admitted to be reasonable, for the misuse of Railway Companies' waggons cause grave concern?" The Scottish representatives agree that the time allowance for discharging waggons—viz., two clear days—is reasonable under proper conditions; but if the very parties who can impose this charge have it also within their power to impose upon any undertaking a surplus delivery of coal which they (the Railway Companies) have previously neglected to deliver in proper sequence, why should the receiver of the coal be made to pay for the neglect of the Railway Companies themselves? In the second place, nobody that I know of, except Mr. Keillor, admits the charge to be reasonable. As a matter of fact, it is four times as much as waggons can be hired for from firms who make their living by the letting out on hire of waggons, bearing all responsibility for repair and upkeep and the liability for change of design, &c. I myself have waggons on hire contract at 4½d. per day, while the Railway Companies wish to charge 1s. 6d. per day for a standing waggon. This surely is not reasonable. Likewise their siding rents are six times more than a reasonable rental for the amount of siding occupied by the standing of one waggon. It is true that gas undertakings and collieries alike have, during the mid-winter seasons in the past, suffered considerably through the shortage of waggons for handling traffic; and I admit that this has arisen to some extent in consequence of the misuse of railway waggons by traders using them as storage receptacles at depôts. To this extent the Railway Companies are justified in the course they contemplate taking. But I maintain that their action is drastic and indiscriminating.

Mr. Keillor's remarks in the second paragraph of his letter, dealing with the question of irregular supplies of coal, &c., disclose his ignorance of the conditions under which even a moderate-sized works are conducted; and although he admits to "having studied the question very closely" and come to the conclusion that the gas industry "need be least of all affected by the new charges," his only suggestion for arriving at this happy state of affairs is the childish one of employing a gang of men to be constantly engaged like children on the sea-shore digging holes in the sand and filling them up again—for the exigencies of daily operations, owing to the irregularities of coal deliveries at a gas-works of any magnitude, would inevitably necessitate such a gang being constantly employed in either discharging waggons in excess of one day's requirements, or else loading up coal to make good deficiencies.

The trading or traffic position of a gas undertaking is perhaps one of the simplest in theory. We can forecast the quantity of coal required on a particular day twelve months ahead. Having this knowledge, our contracts are based on our known requirements; and speaking now more particularly as regards Edinburgh, they are based on the approximate daily quantities required for use. At the beginning of each month instructions to the collieries are sent which indicate the daily quantity of coal that is required. A copy in detail of the collective orders to the different collieries is supplied to the Railway Company, so that they may know the number of waggons to place for our traffic. If these orders were carried out, even within a moderate range of exactitude, there would be no sufferance of demurrage; and the reserve stocks are employed to meet the exigencies of short deliveries during accidental stoppages at collieries, holidays, and other similar occurrences.

These simple conditions are what Mr. Keillor evidently imagines prevail in the ordinary working of railway traffic; and it will be interesting to set forth the extreme variations that do take place. Taking last autumn and winter, a period of extremely fine weather, almost total absence of fog and snow, dull trade and railway traffic at a minimum, in October the delivery of coal to the Edinburgh works ranged from 217 tons on the minimum day to 1251 tons on the maximum day, or a maximum variation of 576 per cent. In November they ranged from 356 tons to 1544 tons, or a maximum variation of 433 per cent. In December, they ranged from 327 tons to 1465 tons, or a range of 448 per cent. In January, they ranged from 140 tons to 1755 tons, or a range of 1253 per cent., whereas during the whole of this time my daily requirements had to be met—neither more nor less could I use, irrespective of the quantities supplied me. Under such circumstances, why should the parties who are not responsible for the irregularities be made to pay for the detention of the waggons?

It is evident from Mr. Keillor's general remarks that he has failed to appreciate the point at issue, and is altogether ignorant of the circumstances under which even a moderate-sized works are required to carry on their operations from day to day. He does not even refer to the idiotic regulation which provides that the Railway Companies will not supply waggons for loading for shipment until the ship is in port and alongside, and other similar restrictions on the freedom of trade which can be of no advantage to anybody, least of all the Railway Companies.

Gas-Works, New Street,
Edinburgh, Feb. 19, 1908.

W. R. HERRING, Chief Engineer.

PARLIAMENTARY INTELLIGENCE.

OPENING OF THE SESSION.

Allocation of Private Bills.

The Fourth Session of the Second Parliament of the present King was opened last Tuesday by His Majesty (who was accompanied by the Queen), with the usual formalities. Next day, the Chairman of Ways and Means (Right Hon. Alfred Emmott) reported to the House of Commons that, in accordance with the Standing Orders, he had conferred with the Chairman of Committees of the House of Lords (the Earl of Onslow) to determine in which House the respective Private Bills should be first considered; and they had decided that the following should originate in the Upper House:—

Alliance and Dublin Consumers' Gas Bill, Bungay Water Bill, Clevedon Water Bill, Donington Water Bill, Fermoy Urban District Gas Bill, Frimley and Farnborough District Water Bill, Grantham Water Bill, Heckmondwike and Liversedge Gas Bill, Lisburn Gas Bill, Lisburn Urban District Council Bill, Pontypool Gas and Water Bill, Risca Urban District Council Bill, Salford Corporation Bill, Shrewsbury Corporation Bill, South Lincolnshire Water Bill, South Staffordshire Water Bill, Stourbridge and District Water Board Bill, Wakefield Corporation Bill, Wells Gas Bill, Worksop Water Bill.

The following will consequently originate in the Commons:—

Aldershot Gas and Water Bill, Ammanford Gas Bill, Amman Valley Gas Bill, Biddulph Gas Bill, Blackwood Gas Bill, Bradford Corporation (Gas, Water, and Electricity) Bill, Bury Corporation Bill, Cardiff Corporation Bill, Conway Gas Bill, Derwent Valley Water Board Bill, Eastbourne Gas Bill, Gaslight and Coke Company Bill, Glamorgan Water Board Bill, Harrogate Gas Bill, Heywood Corporation Bill, Leyland and Farington Gas Bill, Littlehampton Gas Bill, Llanelly Water Bill, Mountain Ash Urban District Council Bill, Northallerton Water Bill, Oldham Corporation Bill, Pontypridd Water Bill, Prestatyn Urban District Council Bill, Swinton and Mexborough Gas Board Bill, Watford Urban District Council Bill, West Gloucestershire Water Bill, York Town and Blackwater Gas (Electric Lighting, &c.) Bill.

With the exception of the Biddulph Gas Bill and the Bradford Corporation (Gas, Water, and Electricity) Bill, all the Commons Bills have been presented and read the first time.

Petitions against Private Bills.

Up to last Thursday, the following petitions (among others) had been presented against the Bills named:—

Aldershot Gas and Water Bill, by the Southampton and Surrey County Councils, the Frimley Urban District Council, the Camberley Electric Supply Company, the Frimley and Farnborough District, Wey Valley, and Farnham Water Companies, the York Town and Blackwater Gas Company, the Conservators of the Thames, and the Farnham Rural District Council.

Alliance and Dublin Consumers' Gas Bill, by the Dublin County Council, the Dublin Corporation, the Dublin Port and Docks Board, and the Blackrock and Kingstown Urban District Councils.

Ammanford Gas Bill, by the Ammanford Urban District Council, the Llandilofawr Rural District Council, the Gas and Water Works Supplies and Construction Company, and the Water Works, Lighting, and Power Investment Corporation.

Amman Valley Gas Bill, by the Ammanford Urban District Council, the Llandilofawr Rural District Council, and the promoters of the Ammanford Gas Bill.

Bungay Water Bill, by the Eye Corporation.

Bury Corporation Bill, by the Bury and Heywood Corporations and the Radcliffe Urban District Council.

Cardiff Corporation Bill, by the Cardiff Gas Company, the Glamorgan County Council, the Merthyr Tydfil Corporation, the Breconshire County Council, the Barry and Penarth Urban District Councils, and the Llandaff and Dinas Powis Rural District Council.

Clevedon Water Bill, by the Somerset County Council and the Clevedon Urban District Council.

Derwent Valley Water Board Bill, by the Nottinghamshire County Council.

Donington Water Bill, by the Spalding Rural District Council.

Eastbourne Gas Bill, by the East Sussex County Council, the Eastbourne Corporation, and the Eastbourne and Uckfield Rural District Councils.

Frimley and Farnborough District Water Bill, by the Hartley Wintney Rural District Council, owners and occupiers of lands, and others.

Gaslight and Coke Company Bill, by the Corporations of London, East Ham, and West Ham, the London County Council, the Wandsworth Borough Council, the Leyton and Wanstead Urban District Councils, and the Ilford Gas Company.

Glamorgan Water Board Bill, by the Breconshire and Monmouthshire County Councils, the Cardiff, Merthyr Tydfil, and Swansea Corporations, a number of Urban and Rural District Councils affected by the Bill, the Bridgend (Glamorganshire), New Tredegar, and Rhymney and Aber Valleys Gas and Water Companies, and the Garw and Pontypridd Water Companies.

Heckmondwike and Liversedge Gas Bill, by the Heckmondwike and Liversedge Urban District Council.
Heywood Corporation Bill, by the Bury and Rochdale Corporations.
Lisburn Gas Bill, by the Antrim County Council.
Lisburn Urban District Council Bill, by the Lisburn Gas Company, the Antrim County Council, and the Hillsborough and Lisburn Rural District Councils.
Littlehampton Gas Bill, by the Littlehampton Urban District Council.
Llanelly Water Bill, by the Burry Port Urban District Council and the Llanelly Rural District Council.
Oldham Corporation Bill, by the West Riding County Council, the Rochdale Corporation, the Chadderton, Crompton, Lees, and Royton, the Failsworth, the Milnrow, and the Saddleworth Urban District Councils, and the Limehurst Rural District Council.
Pontypool Gas and Water Bill, by the Blaenavon and Panteg Urban District Councils.
Pontypridd Water Bill, by the Breconshire and Glamorgan County Councils, the Mountain Ash, Pontypridd, and Rhondda Urban District Councils, and the Llantrisant and Neath Rural District Councils.
Risca Urban District Council Bill, by the Abercarn and Mynyddislwyn Urban District Councils.
Salford Corporation Bill, by the Lancashire County Council, the Manchester Corporation, the Little Hulton and Worsley Urban District Councils, and the Guardians of the Salford Union.
Shrewsbury Corporation Bill, by the Shrewsbury Gas Company.
South Lincolnshire Water Bill, by the Bourne Water Company and the Spalding Rural District Council.
South Staffordshire Water Bill, by the Marquis of Anglesea, the Earl of Lichfield, the Staffordshire County Council, the Dudley, Lichfield, Smethwick, Walsall, and West Bromwich Corporations, the Cannock, Rugeley, and Tipton Urban District Councils, the Seisdon and Walsall Rural District Councils, the Dean and Chapter of Lichfield Cathedral, and others.
Swinton and Mexborough Gas Board Bill, by the Swinton and Mexborough Gas Company and the Rawmarsh Urban District Council.
Wakefield Corporation Bill, by the Barkisland and Rishworth Urban District Councils.
Watford Urban District Council Bill, by the Hertfordshire County Council and the consumers of water who are supplied therewith by the Colne Valley Water Company in the urban district of Watford.
West Gloucestershire Water Bill, by the Bath Corporation, the Bristol Water Company, and the Thornbury Rural District Council.
Worksop Water Bill, by the Lincoln and East Retford Corporations, and the Nottingham County Council.
York Town and Blackwater Gas (Electric Lighting, &c.) Bill, by the Aldershot Gas and Water Company, the Camberley Electric Supply Company, the Surrey County Council, the Wokingham Corporation, the Frimley Urban District Council, and the Easthampstead and Wokingham Rural District Councils.

In the House of Commons last Friday, a Bill "to promote the earlier use of daylight in certain months yearly, and for other purposes relating thereto," was presented by Mr. Dobson; and another "to empower local authorities to acquire water rights otherwise than by agreement," by Mr. Leif Jones. The former is to be read a second time on the 5th prox., and the latter on the 16th of April.

Theft from the Ilford Gas Company.

At the Stratford Police Court, last Tuesday, James Jeeves, a carman, was charged with stealing two sacks of coke, valued at 2s. 6d., the property of the Ilford Gas Company; and Charles Hunt, a hawker, was accused of receiving the coke, well knowing it to have been stolen. Jeeves was in the employ of a contractor to the Ilford Gas Company; and on the Monday morning he was instructed to deliver 26 sacks of coke to the Claybury Asylum. A couple of hours later, he was seen to go to the rear of Hunt's house with two sacks of coke. He emptied these, and was returning to his trolley when a policeman asked him if he had the authority of the Gas Company to deliver the coke there, and whether he had received payment for it. He then said, "Give me a chance, and I will go and pick it up. I know I have done wrong." Hunt was spoken to about the matter, and said, "I know nothing about it. He only brought it here, and I took it in." The men were then arrested. Hunt repeated this statement in defence; and the Bench, considering the case was not strong enough, discharged him. Jeeves was sentenced to one month's hard labour.

The Company-Promoting Frauds.—At the Mansion House Police Court, on Friday, Walter Darby was charged, on remand, with conspiring with two men, named Gyde and Marcus, to defraud the public in connection with the Slate Quarries Companies. The prisoner, it will be remembered, was concerned with the same men, who are now in prison, in promoting the Kent County and West Suburban Gas Companies. He was for some time a fugitive from justice; but was arrested at Liverpool and brought to London, as reported in the "JOURNAL" last week (p. 471). Additional evidence having been given, the further hearing of the case was adjourned.

Supplying Water beyond Statutory Limits.—In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Neville had before him a case in which the Attorney-General, on the relation of the Bristol Water Company, applied for an injunction to restrain the West Gloucestershire Water Company from supplying water outside the limits of their statutory district. The dispute arose in respect of a house situated in the parish of Henbury, in the district of the Bristol Company, but near the border of the parish of Almondsbury, in the other Company's district, the parish boundary running through the property in question. In the result, his Lordship granted the injunction. A report of the case will be given next week.

MISCELLANEOUS NEWS.

SOUTH SUBURBAN GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, at De Keyser's Hotel, Victoria Embankment, E.C.—Mr. ROBERT MORTON in the chair.

The SECRETARY (Mr. Charles M. Ohren) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

THE LATE CHAIRMAN AND THE NEW DIRECTOR.

The CHAIRMAN, in moving the adoption of the report and accounts, said, by the death of Sir George Livesey, the proprietors had lost a great and exceptionally-gifted Director, and the Board and employees a generous and true friend. But though they had lost his genial presence and missed his familiar voice, the principles which guided him, and his spirit and example remained, and would ever be cherished by, and be helpful to, those who followed him. Not a little was being done to perpetuate Sir George's memory. The Institution of Gas Engineers had initiated a movement to provide a national monument to him, which was to take the form of an endowment of a Professorship at Leeds University, to be called the Livesey Professorship of Gas Engineering and Fuel. For this purpose, a sum of not less than £10,000 would be required. Two-thirds of this had been obtained; and there was little doubt that the balance would soon be subscribed. The Directors, on behalf of the Company, had contributed £200. In this connection, he had pleasure in stating, and he was sure the proprietors would be pleased to know—as indicative of the warm feelings of remembrance, respect, and regret entertained for their late Chairman—that the workmen and staff were about to erect a memorial in the works on their own account and on their own initiative. It might be remembered that the whole body of employees followed Sir George's remains to their last resting-place. In selecting Mr. Carpenter to fill the vacancy caused by their late Chairman's death, the Board were influenced not only by Mr. Carpenter's eminent qualifications as a gas engineer and administrator, and his known devotion to the co-partnership system, but also by the knowledge that Sir George had looked forward to his joining the Board at some future time. As a Director and the Chairman of the South Metropolitan Gas Company, Mr. Carpenter had given proof of his ability in these capacities; and the Board were confident they had in him a colleague who would prove of great service to the Company. That he had already done so would appear later on in what he (the Chairman) had to say.

THE FINANCIAL POSITION.

Passing to the accounts. The reduction of 1d. per 1000 cubic feet in the price of gas which was made at the beginning of the half year had the effect of reducing the receipts by £2312; and there was a further reduction under this head of £842, owing to a slight falling off of a little more than 1 per cent. in the quantity of gas sold. The returns for residuals had been somewhat disappointing. Coke had yielded £5730 less; tar, £739 less; while ammonia, owing to cheaper acid and improved working, had yielded £193 more. These losses of revenue, however, had been more than met by the saving on the coal bill of £6922, and a reduction in working expenses of £6171. Contracts for coal were now rather favourable; and, though the Coal Mines (Eight Hours) Act would no doubt affect the market somewhat, the Directors had reason to hope that they would be able to buy on satisfactory terms this year. The decrease in working expenses was a very satisfactory feature in the accounts. It was due, first, to a reduction in the cost of carbonizing by £1704, or to the low figure of 1s. 4d. per ton, which was the lowest figure yet reached by the Company; and, second, to the increased make of gas per ton of coal carbonized by 400 cubic feet. This showed that work in the retort-houses had been well and carefully done. There was a reduction of £4475 in the cost of maintenance of works. This was not due to the works having been in any way starved. On the contrary, they had been well kept up and improved in many important respects; but it showed that the large sums which had, for some years past, been spent in repairs and renewals were reducing present expenditure. This was as it should be, and reflected credit on the Engineer (Mr. S. Y. Shoubridge). The net result was a profit of £22,687. This was sufficient to pay the full dividend at the rate of 5½ per cent. authorized by the sliding-scale, and to increase the amount carried forward by £1933. He would here point out how the reduction in the price of gas affected the different parties' interests. Employees' bonus benefited by £300, the proprietors' dividend by £504, and the consumers by £2312, or very nearly three times as much as the other two.

REDUCED CONSUMPTION AND INCREASED BUSINESS OUTLETS.

The reduction in the consumption of gas caused the Board no anxiety. It was not peculiar to the Company, but had been experienced more or less over the whole country, caused partly by the mildness of the weather, partly by the increasing use of improved incandescent burners, and not a little, he was afraid, by depression in trade, which they all hoped would very soon revive. In this connection, it was gratifying to note that, in their case, although the output of gas had been less, there had been a very substantial increase in the number of consumers; no less than 600 having been added. A further proof of increasing appreciation by the public of the advantages of gas for cooking and heating was that 620 additional cookers and 700 gas-fires had been fixed. In order to make the advantages more widely known, the Directors had opened two more show-rooms in the district. These were a convenience to the consumers, and were doing much to demonstrate to the general public the great advantages of the use of gas for cooking and heating.

INVERTED GAS-BURNERS BEAT METALLIC FILAMENTS.

In the department of public lighting, too, the Company had had the opportunity of proving the superiority of gas over electricity with its most improved methods and latest appliances. In one of the districts supplied by the Company, the Local Authority had owned the electric

light works for some years; but comparatively little business was done, as the vast majority of the residents preferred to use gas. The Council a short time ago determined to abandon the use of gas for public lighting, and gave notice to the Company to terminate their agreement. The Board asked to be allowed to show the Council and the public what could be done in lighting by means of new inverted incandescent burners. To this, the Council agreed. About a dozen lamps designed by Mr. Carpenter (and this was the service of that gentleman to which he referred earlier in his address) were fixed in one of the principal roads, adjoining another road having lamps fitted with the best electric Osram lamps. The trial lasted for several months; and, as the result, the Council decided to light the whole of the district, containing 700 lamps, with the new gas-burners, and had given the Company a contract for seven years.

CO-PARTNERSHIP.

Co-partnership in gas-works continued to verify all that was predicted for it by its founder. That it contributed largely to smooth and regular working and to the prosperity of the Company, was abundantly proved by the great reduction in working expenses, which contributed so much to the success of the half year. The greatest unanimity and good feeling prevailed among the employees. Their investment in the Company's stock now amounted to the large sum of £31,193. It was very gratifying to know that the system was now spreading. No less than ten gas companies adopted it last year—the latest recruit being the Gaslight and Coke Company.

THE WATER BOARD'S CHARGES AND THE ALTERNATIVE.

It would interest the proprietors to know that, owing to what were considered extortionate demands on the part of the Metropolitan Water Board, the Company had united with other London Companies in resisting the claims; and a friendly action had been arranged with the Water Board to test the legality of their proposed charges, or the basis on which they were founded. This would be shortly tried in the High Court. Hitherto, when the works were supplied by a Water Company, the water was measured through a meter, and cost about £50 a year. The Water Board refused to supply in this way, and proposed to charge on the rateable value of the works, and demand £884 for the same quantity of water. During negotiations and pending the action referred to, the Board had caused an artesian well to be sunk on the works; and they now had an abundant supply of excellent water. This was obtained at very small cost; and the Company were independent of the Metropolitan Board's supply.

Mr. CHARLES CARPENTER said it gave him great pleasure to second the motion for the adoption of the report and accounts. The Chairman had dealt so fully with all the items, that there was really nothing left for him to say with regard to them. He thought, however, he ought to mention that he (Mr. Carpenter) had gone through every item in the balance-sheet, and compared them with the previous workings of the Company, and with those of other companies also; and there was not a single item with which they should not consider themselves thoroughly satisfied, while there were many of which they should be extremely proud. The dividend they were now entitled to was one for the equivalent of which they had to go back to the year 1907; and the satisfactory feature of the past half-year's working was that this result had been accomplished in spite of the fact that the price of coal had not reverted to the figure at which it stood in the former year. When he said this, he spoke very highly of the improved working of the Company, which could only have been brought about by the loyal endeavours of all those upon whom rested the responsibility for the results.

Mr. HAROLD GUNDRY remarked that he felt sure everybody on the shareholders' side of the table warmly endorsed all that had been said with regard to their late Chairman. Sir George Livesey's death was a serious, and in some ways an irreparable, loss to the Company. He was able to an extraordinary degree in conducting business. He was kind and courteous to everybody; and he gained the respect and the esteem of all with whom he came in contact. It was impossible to mention all the benefits he conferred upon the Company; but there was one which alone entitled him to their perpetual gratitude—the system of co-partnership. What they had in their Company was co-partnership in its best form; and what was the result? While other commercial undertakings were torn by internal dissensions, their own Company was a united family, of which every member was anxious for the commonweal of the undertaking. Much, however, as they would miss Sir George Livesey, they had only to read the present report to feel sure the interests of the Company were in safe hands. It was no small achievement that, while the price of gas had been reduced, while the amount received for bye-products had gone down, and while the quantity of gas consumed had also decreased, the Board had been able to declare the full statutory dividend of 5½ per cent. and have no less than £9681 to carry forward. This was an excellent result; and it was only right that they should say how much they appreciated what the Directors had achieved. As a resident in Beckenham, also, he would congratulate the Board on the fact that they had secured the seven years' contract to which the Chairman had alluded in his speech. He thought it was most satisfactory that the Company had acquired in the past half year 600 new customers, and that 700 additional gas-fires had been supplied and 40 more public lamps fixed.

The resolution was then carried unanimously.

OTHER RESOLUTIONS.

On the proposition of the DEPUTY-CHAIRMAN (Mr. Jabez Light), seconded by Mr. R. WYLLIE, a dividend for the half year ended Dec. 31 was declared at the rates per annum of 5 per cent. on the preference stock and 5½ per cent. on the ordinary stock—less income-tax. Mr. Wyllie remarked that the workmen co-partners had helped in a great measure to earn the dividend; and he thought the proprietors could say that co-partnership was the best method of carrying on the work. It had a good moral effect on the men.

The DEPUTY-CHAIRMAN, in moving that Mr. Robert Morton be re-elected a Director of the Company, said that since their last meeting they had lost their leader; and while they could not think that his place could be entirely filled, yet he ventured to say that in Mr. Morton they had as complete a follower of Sir George as could be found in the United Kingdom.

Sir J. FORTESCUE FLANNERY, who seconded the proposal, pointed out that it was a motion to re-elect Mr. Morton, not to the chairmanship of the Company, but to his seat on the Board. It was a great pleasure to the Directors to elect Mr. Morton to the chair; and he (the speaker) did not doubt that, following on the passing of this resolution, the Directors would again appoint him Chairman. As Mr. Light had said, Mr. Morton was a follower of the great leader—the leader of men. This was the first meeting since they lost Sir George Livesey. Reference had already been made by the Chairman to this loss; but it might not be altogether out of place for another member of the Board to allude to it. He himself had the most grateful personal recollection of Sir George. He felt for him the most sincere respect and attachment in his lifetime; and he was sure that the shareholders of the Company joined with him in mourning his decease. He had left a mark behind him which would never be effaced, because after this generation had passed away, after the men who were now here had disappeared, there would still survive the great improvement that he had made in the relationship between employer and employed. The system of co-partnership originated with Sir George Livesey; but it had not died with him. In fact, he (the speaker) believed that it never would die now that it had been so firmly established in the economy of this country. They were certain that, having lost Sir George, they would have all his traditions, all his wishes, understood and perpetuated in the hands of the present Chairman.

The motion having been carried,

The CHAIRMAN remarked that Mr. Light had used language which he felt he must protest against. He knew Sir George for many years very intimately; and there was no one in the room or elsewhere who thought more of him or loved him or his memory better than did he (Mr. Morton). However, that he could anything like fill his place was, to his thinking, altogether out of the question. He (Mr. Morton) had been acting as Chairman for some time, and had tried to do his best; and if he had given his colleagues satisfaction, he was glad. He could not trust himself to say more on the subject. He had, however, to propose the re-election of Mr. Light, who had been a Director for several years, and had been a most useful member of the Board. His acquaintance with railway business had been of great value to the Company, who had, of course, a good deal to do in connection with coal import and coke export.

Mr. CHARLES HUNT seconded the proposal, which was at once carried; and Mr. LIGHT acknowledged his re-election.

On the motion of Mr. SAMUEL WOOD, seconded by Mr. T. WILKINS, Mr. Thomas Guyatt was re-appointed an Auditor.

VOTES OF THANKS.

Dr. SIDNEY TURNER proposed a hearty vote of thanks to the Chairman and Directors. He said he was sure that no one in the room regretted that he was in the position of Chairman more than did Mr. Morton himself. To follow Sir George Livesey was a great task to put on any man's shoulders; but among his many other qualities, Sir George possessed that of being able to inspire other men with his ideas and his principles, and he was quite sure that these principles would be carried on by the present Chairman in the same spirit that he had bequeathed them to him. Sir George must have had a happy existence, as it was not given to many men to see the fruits of their labours as he saw the fruits of his. But it was in the future that the full fruition of his work would be seen. He had bequeathed something like £20,000 to those who worked with him; but he had also left a priceless legacy, not only to the gas industry, but, they knew, to the shipbuilding business, and, in fact, he believed, to the whole world of industry. The Chairman had had a most excellent master; and he felt sure that he had been a most apt pupil, and would carry forward the work which Sir George had bequeathed to him. Mr. Carpenter, too, was one of the greatest experts in gas; and the South Suburban Company could not fail to be benefited by the presence of such a man on the Board.

The motion having been cordially passed,

The CHAIRMAN, after acknowledging the vote, proposed that the officers and employees be heartily thanked for their services. The shareholders would remember that Sir George spoke very highly of the chief officers—the Secretary and the Engineer—as well as of the co-partner workmen. It was a very great pleasure indeed to have officers and men of this kind; and they continued to be what they were in Sir George's time. As he had mentioned in his speech, there was great credit due to the chief officers—and especially the Engineer—for the conduct of the work during the past half year. The results spoke for themselves.

Mr. HUNT seconded the proposition; and it was heartily carried.

Mr. SHOUBRIDGE, on behalf of the engineering staff and workmen, thanked the shareholders for the vote. As shareholders and as co-partners, he said, the employees benefited from the improved working, and therefore were not entitled to any thanks for what they did. It was, however, very gratifying to be assured that they were giving satisfaction. He was sure that every employee would desire to be associated with what had been said with regard to their late revered Chairman, Sir George Livesey. He was to every one of them, not merely a master, but a friend. He studied their interests, and was kindness itself to all. They would never be able to sufficiently show their gratitude; but they would do all they could to promote the growth of the wonderful system of co-partnership. It had done for them all such very great things, that it would be their effort to show their appreciation of what Sir George did for them.

Mr. OHREN, on behalf of the office staff, also briefly returned thanks; and this concluded the proceedings.

Shortage of Rainfall and Water Supply.—At a meeting last week of the Sleaford Rural District Council, Mr. W. Marsden reported a serious drought in the district, caused by shortage in the rainfall. He said the supply at many of the water-works in the villages was very short, and in others had ceased altogether. The Wilsford Parish Council reported that the yield at their newly-constructed water-works was both meagre and inadequate, and asked that an independent expert might be called in to make a test. It was, however, resolved that further tests be made by Mr. Marsden before calling in any other advice.

CROYDON GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, at the Offices, Katharine Street, Croydon—Mr. THOMAS RIGBY, the Deputy-Chairman, presided, in the absence of the Chairman, Mr. Charles Hussey, J.P. It was explained by Mr. Rigby that Mr. Hussey felt it utterly impossible to attend the meeting, having suffered a great loss in the death of his wife. He was sure the proprietors would express their sympathy with the Chairman in his bereavement.

The SECRETARY (Mr. W. W. Topley) read the notice convening the meeting; and the report and accounts were taken as read.

The DEPUTY-CHAIRMAN called upon the Secretary to read the address to the proprietors that the Chairman had prepared.

INCREASE IN CONSUMPTION.

In the course of the address, Mr. Hussey said he thought the accounts the Directors had to submit, while they showed slightly reduced profits when compared with those of the two preceding half years, could, in the main, be regarded as satisfactory. The Company, in common with all gas undertakings, had been adversely affected by several causes. The mildness of the autumn and early winter had not been favourable to the sale of gas; and the increase against a year ago—1·39 per cent.—was less than that to which they had been accustomed. Still, when it was remembered that several Metropolitan and Suburban Companies had, from causes similar to those which affected their own Company, to record a decrease in sales, the comparison was in their favour. But other causes than those of climate had tended to reduce the output. There was a marked slowing-down in building development within the area of supply; and the steady extension of incandescent gas lighting meant that the consumers were year by year, in growing numbers, getting more light with a lessened consumption of gas. The Company welcomed the extension of this system, which made gas by far the cheapest lighting agent of to-day, even in face of the introduction of the modern expensive and fragile electric lamps. The revenue, as compared with the June half year, had been affected, too, by the reduction of 2d. per 1000 cubic feet in the price of gas, which took effect in October. This had cost them in the half year some £3000, during a period in which coal prices had still ruled somewhat high, while coke had been depressed in value. When the advance of 2d. per 1000 cubic feet took place last January, he stated that it was made reluctantly by the Directors and would be withdrawn as early as possible, and this he thought they could claim to have done, even at some sacrifice.

RESIDUALS AND THE SALE OF COKE.

To the unsatisfactory market for coke, he had alluded. The net receipts from coke and breeze were some £3000 less than a year ago, while the prices obtained for sulphate of ammonia showed a reduction of 12s. 6d. per ton. While referring to coke, it might be of interest to the proprietors to know that, of the sales of this residual, some 25 per cent. was sold for use in the district—the remainder being sent from the works by rail to customers. The percentage of local and retail sales compared, he believed, not unfavourably with that attained by other companies whose circumstances were similar to their own; but, if the advantages and economy of the domestic use of coke were better known among the consumers, a largely increased proportion of the make—say, 50 or 75 per cent.—would be sold locally with advantage alike to their customers and themselves. It would, however, be unwise to expect any material improvement in the prices for coke in the early future. Indeed, indications were rather in the direction of the market being still lower. But he was glad to be able to say that they had made contracts for the purchase of coal and of oil commencing in July next which would secure substantial savings under this head.

CAPITAL AND EXTENSIONS.

It would be seen that, by the issue in October of £10,000 of "C" stock, their capital powers were exhausted so far as stocks were concerned that were affected by the sliding-scale. Future capital requirements would be met by the issue of "D" 5 per cent. stock, or of debenture stock. In the half year, at the works they had completed, and brought into use, the new sulphate-making house with very satisfactory working results, both as to quantity and quality of make. The electric power house had been completed, and was being equipped with dynamos, driven by gas-engines, to produce the current which would be required for the coal and coke handling plant when the reconstructed No. 2 retort-house was brought into operation. The railway extensions at Waddon were now completed including the sidings connecting to the Railway Company's line at the south end of the works. It might be remembered that some three years ago he pointed out the conveniences and advantages they would experience, and the savings they would effect, if able to take coals or stores to any part of the works by rail, and bring goods in, or send them out, at either end of their present extensive works.

INCREASING POPULARITY OF GAS-FIRES.

With a passing reference to cooking demonstrations by a lady lecturer, the Chairman said it would be seen that there had been a satisfactory increase in the number of gas-stoves on hire and sold during the half year. The increase in the number of gas-fires was greater than in any previous half year; and as consumers got to more generally appreciate the fact that, for a rental of only 1s. per quarter, or 1d. per week, they could, without any charge being made for fixing, obtain the use of an artistic and well-constructed fire that would not only give warmth without smoke or trouble, but would enable them to boil water at any time, the Company might expect that a still larger increase in this use of gas would be experienced.

NET FINANCIAL RESULT.

The net financial result of the half-year's working was that the profits, with the balance brought forward, would admit of the payment of the usual dividends—carrying forward the very good balance of £5589.

CO-PARTNERSHIP.

He had purposely left till last, mention of the most noteworthy feature of the half year. He referred to the decision of the Directors to adopt the principle known as "co-partnership," for which the sum of £600 had been provided from revenue. The Directors had given the subject their most careful consideration, recognizing its far-reaching importance; and it was because, after seeing the experiences of other companies, they believed that co-partnership would prove in the long run not only a great benefit to the Company's employees, but an advantage to the consumers and the proprietors, that they had instituted the scheme. It was no untried venture. One large company had had the system in operation for twenty years; and their neighbours—the South Suburban Gas Company—for a not much shorter period. It was being now widely adopted among gas companies, and was spoken of with approval by eminent men of the most diverse political opinions. It aimed at interesting the employees of the Company in the business not only as wage earners, but as partners. It was found that the companies who had had the system longest in operation were the most unreserved in their praise of it. It might be asked, "Why take this step when such good and cordial relations existed, and had for long existed, between the Company and their workmen?" The answer of the Directors was that they had taken the step not to allay discontent, for that did not exist, but to benefit the Company's employees, to improve their condition, to encourage thrift among them, to give them an added interest in their work, and to consolidate their existing very happy relationships with the Company. It was further believed that co-partnership would enlist their active co-operation in the prevention of waste, the promotion of efficiency, and the extension of the Company's business, which must tend to reductions in the price of gas, and add stability to the Company's business.

THE LIVESEY MEMORIAL FUND.

One could not refer to co-partnership without a thought of the great leader of the gas industry who had recently passed away—Sir George Livesey. The whole industry owed him a large debt of gratitude. Most of the proprietors knew that it had been decided that a tribute to his memory should be provided, to take the form of the establishment and permanent endowment of a Professorship of Gas Engineering and Fuel at the Leeds University, to promote the study of special scientific problems connected with the use of gaseous fuel. This branch of research was one in which Sir George Livesey took a very great interest; and he was engaged in his latter days promoting the endowment of this work, which would benefit the whole industry. There would seem to be no more fitting tribute to his memory than to place on an assured and permanent footing a work in which he took so great an interest; and he was sure the proprietors would cordially support the Directors' decision to contribute from the moneys of the Company £200 to the fund that was being raised for this object.

ELECTRICITY AND GAS IN A SHOPPING CENTRE.

The DEPUTY-CHAIRMAN said with regard to the consumption of gas, they considered the small increase was a favourable one under the circumstances of the half year. It was true their area of supply was not developing so quickly as in former years; and there was another matter they might take into consideration—that was the great depression of trade that had been hanging over the country for a considerable time. Until this had passed away, they could not look for any material increase in their business. There was a very satisfactory feature that their Secretary had unearthed. It was thought that the Company were losing ground very rapidly in that great shopping centre, the North-End. From figures got out by Mr. Topley, it was found that they were not losing—in fact, they were gaining—ground; for, during the last three years in this area, they had had an increase of 5 per cent. in revenue. One large consumer of electricity in North-End had found it worth while to make use of gas for the production of current. This was a fact that could not be too widely known among users of large quantities of electricity. There was no doubt there was economy in employing gas for the production of the current. They were much indebted to their Distribution Department for the energy shown in these matters. During the recent cold snap, there had been a very satisfactory increase in the consumption of gas. As to co-partnership, he had every reason to suppose it would prove of advantage to all. With pleasure, he moved the adoption of the report and accounts.

Mr. SAMUEL SPENCER seconded the motion, which was unanimously carried.

Mr. WILLIAM CASH proposed the declaration of the dividends at the following rates per annum: On the "A" stock 14½ per cent., "B" and "C" stocks 11½ per cent., "D" stock 5 per cent., and "E" stock 10 per cent.—all less income-tax. He remarked that the payment of these dividends slightly reduced the carry-forward at the end of the half year; but, during the half year, they had added an amount to the reserve and insurance fund account which was equal to the sum they had taken out of the balance brought into the half year.

Mr. PERCY H. HALL seconded the motion, which was adopted.

The retiring Directors (Messrs. Cash, Hall, and W. J. Russell) and Auditor (Mr. John Jones) were unanimously re-elected.

Mr. R. HESKETH JONES moved a vote of thanks to the Chairman and Directors; and, in doing so, he suggested that a letter should be addressed to the Chairman, expressing the sympathy of the proprietors with him in his bereavement.

Mr. SAMPSON seconded the motion; and both it and the suggestion were at once unanimously passed.

The DEPUTY-CHAIRMAN, having acknowledged the vote on behalf of himself and colleagues, moved a similar compliment to the officers, staff, and workmen—individually mentioning the excellent work for the Company of the General Manager (Mr. James W. Helps), Mr. A. Caddick at the works, Mr. Sandeman in the distribution department, Mr. Topley as Secretary, and Mr. Haines in the rental department.

Mr. CASH, in seconding, said the workmen had accepted co-partnership in a true spirit, and their thanks had been offered to the proprietors through the Board. In this connection, he should like to say that they had a large number of comparatively small shareholders in the Company, as was seen by the fact that the average dividend only worked

out 'to something rather less than £15. When it was said that the Company was a capitalist undertaking, people should remember that it was hardly a proper description to apply to a mere aggregation of people who put their savings into it. They were not capitalists in any greater sense than would be the workmen under this scheme.

The motion was heartily carried.

Mr. HELPS said he had great pleasure for the fiftieth time to thank the proprietors for their very kind vote of thanks. (Applause.) He had greater pleasure than ever in speaking that day, because he felt that something had been done through co-partnership during the half year which would redound not only to the credit, but to the advantage of the Company generally. He was glad to hear the Chairman's recognition of the excellent work done in the distribution department.

Mr. TOPLEY, in replying, also referred to co-partnership—pointing out that there was a difference between serving an undertaking in which one had no part or lot, and in serving one in which, even in some small measure, one was a shareholder and owner.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Saturday, at the Offices, High Road, Tottenham—Sir DANIEL F. GODDARD, M.P., the Deputy-Chairman, presiding.

INDISPOSITION OF THE CHAIRMAN.

The DEPUTY-CHAIRMAN, before commencing the proceedings, said he had heard that afternoon, with great feelings of regret (which he felt would be shared by all the proprietors), that their highly-esteemed Chairman (Mr. Corbet Woodall) was unable to be present with them that day. Mr. Woodall was, unfortunately, confined to his bed with a severe chill; but, even then, he would, he (Sir Daniel) believed, have put in an appearance except for the most explicit orders of his doctor, who told him he must not run such a risk. The proprietors would agree with him that so valuable a man should not run risks; and therefore they would put up with his absence on this occasion, and send him a message of their sympathy with him in his sickness, with the expression of the hope that he would speedily recover.

The SECRETARY (Mr. E. Topley) read the notice convening the meeting; and the Directors' report and the accounts for the half year were taken as read.

The DEPUTY-CHAIRMAN moved their acceptance. In doing so, he said that this was just where he felt so grievously the absence of their Chairman. Mr. Woodall had not only a complete command of all the figures and details relating to the undertaking, but he spoke with an authority that perhaps nobody else possessed in the gas industry. He spoke not only to the proprietors of the Company, but to the whole of that part of the world interested in gas production and sale. He (Sir Daniel) could not hope to do that.

WELCOMING THE EMPLOYEE CO-PARTNERS.

He did not think their meetings could ever be called dull or monotonous; but that day there was a special and peculiar interest attaching to the meeting, because since the last gathering of the proprietors, they had added 400 of the employees as co-partners in the concern. This was the first occasion they had the opportunity of having the employee co-partners at their meetings; and he should like to address to them a word of welcome. The total number of co-partners who had joined the Company under the new scheme was 605; and out of these 400 had acquired stock of the value of £5 and upwards, and were therefore entitled to be present that day. The average holding amounted to £7 6s. 7d. In addition to the Company's bonus, there had been deposited by the employees a sum of no less than £1476, which might be treated as their savings. On this occasion it would not be necessary for him to dwell on the ethics of the principle of co-partnership. But he might say the Directors were convinced that this new scheme would operate to the good of the servants of the Company; and that the community of interest thus set up between employees and investors must spell even greater prosperity in future than had been shown in the past.

INCREASED BUSINESS AND CAPITAL EXPENDITURE.

Turning to the more particular matters of the report, he said the rate of the increase of business had been well maintained. It was a very happy position to be in to be able to make a statement of this kind, But he wished to be a little cautious in his remarks under this head, because it must be remembered that every time the Directors appeared before the proprietors they had to show an increase on what was a year before also a large increase, and which it became much more difficult every year to reproduce. The natural order would be that the increase should diminish each year, because the percentage increase was a more difficult one to maintain. However, they had made the considerable increase of 7·63 per cent. There had also been an increase of the capital expenditure amounting to £22,821. This might seem a large sum; but if they looked at it carefully, they would find the capital expenditure was always in exact proportion to the increase in the business. The capital of the concern that day was well under £450 per million cubic feet of gas sold, which was a very creditable and highly satisfactory figure for an undertaking of this kind. In the winter, they began operations with a new retort-bench; but unfortunately it quickly disclosed some defects. They were therefore obliged to shut-down its working for the time being. He was happy to tell the proprietors that the contractors for the work had promptly accepted all responsibility for the defects, and he believed were now engaged remedying them. Otherwise, the whole of the works and plant had been maintained in their usual efficient condition and excellent order. Perhaps he might be allowed to say, speaking as one who had had practical experience all his life in the work of a gas undertaking, that the condition of their works reflected the highest credit upon the Engineer and his staff.

REDUCTION IN PRICE—MIGRATORY PREPAYMENT CONSUMERS.

The report referred to a further reduction in the price of gas. In regard to this, he wished to say (and he was now saying what he knew the Chairman would have liked to have said on this occasion) that, in making this reduction, they were continuing what had always been the policy of the Company—that was, to try to sell the gas at the lowest possible price commensurate with safety, quality, and good working. The Board hoped to continue this policy; and it was because of this that they had only reduced the price of gas on this occasion by 1d. per 1000 cubic feet, instead of 2d., as had been the usual plan. It would be observed that the balance carried forward on this occasion was slightly lower than the balance carried forward at the corresponding time last year. This was not due to any deficiency in the working. They had fairly earned the dividend; but the small lowering of the balance was on account of the bonus payment, which was larger than the difference of the carry-forward. In view of this, and because the Directors were most anxious to avoid anything like a reverse of the policy of reduction, they were going to be cautious. He might say, in regard to the reduction of 1d., that it was giving a slight advantage to those consumers who took their gas through prepayment meters. This was an important consideration when they remembered that consumers to more than double the number of their ordinary consumers were using prepayment meters. To these consumers the reduction meant rather more than a penny. The penny represented the sacrifice of something like £3000 that the Company conceded to the consumers; but what the proprietors gained was a comparatively small sum. Speaking of the prepayment consumers, perhaps he might remark here that they were very largely increasing. But the statistics in regard to them showed some rather curious results. They indicated how migratory was the population in a district like theirs. What it really worked out to was this: That, on the average, every prepayment consumer moved once in three years. This did not necessarily mean that he moved out of the district, or did not continue to take their gas; but that he moved from one house to another in one district, or from one district to another, within the range of the Company's operations. The proprietors would, of course, understand how removals so constant and common as this necessitated a large amount of attention and work on the part of the Secretary and his staff, who had to keep pace with all this kind of thing. To this department was also largely due the increase in the number of stoves used. There had been an increase over the corresponding period of last year of something like 6873 heating and cooking stoves; and to this they might attribute a great deal of the increase in their business. It was a profitable and happy increase for the Company; and the people who used the stoves found them economical and useful. It answered the purpose of the Company, too, that they should be used in the daytime instead of in the evening hours, when the demand for lighting was at its highest level.

SALE OF COKE IN SMALL BAGS.

Another feature that had been introduced—thanks to the initiative of their Engineer (Mr. A. E. Broadberry)—had reference to the sale of coke. They at times experienced difficulty in disposing of their coke locally at a profitable price. They came into contact in the sale with large concerns, and found it very difficult to realize good prices. With the view of increasing the demand among the ordinary dwellers in the neighbourhood, they had established a system of selling coke in paper bags containing 28 lbs. This might seem somewhat trivial, and of very small importance for him to allude to. But these little things had a wonderful way of growing into large things; and this had proved to be one of the most successful methods of increasing the coke sales for domestic purposes. They only began this on Oct. 15 last; and, up to the present time, they had in this way sold 359 tons of coke, which they would not have disposed of locally by any other method. This improvement in the means of sale had the advantage of bringing this fuel within the reach of everybody who wanted to use it; but it had the still greater advantage—an advantage which belonged especially to large cities—of having an important abating effect on the smoke nuisance.

NO STANDING STILL.

From practical personal experience, the business of gas making and distribution was one that could not afford to stand still. It must always be progressive and growing. With the competition of the electric light, it was necessary for a gas company to be always on the *qui vive* for everything new. The manufacturers and the discoverers of inventions were always at work on new lines; and it was for gas companies to take up the successful ones and use them to the best advantage. In the long run, he believed it would be found that a progressive gas company was well able to take its stand against the competition of any other light that might be produced or used. He was Chairman of the Ipswich Gas Company; and there they had to compete with the municipal supply of electricity. He could assure the proprietors that it was an awkward competition when an undertaking had the backing of the ratepayers' money, which enabled a corporation to put down the prices of electricity to the lowest points, because it did not matter whether or not they paid. But even at Ipswich, under these conditions, they had been absolutely able to compete with electricity in such matters as shop front and public lighting. The new inventions in gas lighting that had made so great a stride in the last few years had enabled them to replace the electric light by some of the more modern forms of gas lighting. This was satisfactory. When they could get by gas, as could be got nowadays, over 1000-candle power per hour for a penny, he thought they need not be afraid of any competition anyone brought against them.

A NEW ISSUE.

Very shortly there would be a fresh issue of capital for the undertaking. They could not extend their business without having also to extend their capital. There would therefore be almost immediately an issue of £30,000 of "B" stock open to tender, at a minimum price of £108. They were always pleased to have residents in the district come and take up their stock, as well as the existing proprietors.

Mr. HENRY BAILEY seconded the motion.

The DEPUTY-CHAIRMAN, replying to questions, said the unaccounted-for gas in the half year appeared to be a little higher than usual; but the average for the year was less than the previous year. To give place to electric light, some 40 public gas-lamps had been taken off; but there was an increase which more than accounted for them. On the whole, the public gas-lamps had increased from 4510 to 4608.

Mr. MITCHELL respectfully urged the Board to discriminate, in adopting new plant, between that which was merely invention and that which had been proved by successful experiment to be real invention.

He also asked them to consider the desirability of instituting a reserve fund for the purpose of equalizing the dividend. As to co-partnership, he heartily wished success to the new development of this enterprising Company.

Mr. E. L. BURTON, in congratulating the Board and the proprietors upon the successful working of the half year, said it was known to many of those present—probably to all—that the Company exhibited one of the most phenomenal successes of any of the Suburban Gas Companies. He had been looking into some of their old accounts, and went back two decades. He noticed that in 1888, the sale of gas was 263 million cubic feet. At the end of the following ten years, it was 497 millions, or nearly double. In the next ten years, it increased to 1383 millions. This growth had been accompanied by a great reduction in the capital per million. The Company stood in an almost unique position—that was to say, it was one of the lowest capitalized Companies in the suburbs of London, and at the same time they were selling gas at 2s. 5d. per 1000 cubic feet.

The DEPUTY-CHAIRMAN, in answer to Mr. Mitchell, said the Company had a reserve fund composed of two parts. There was the reserve fund proper and the balance carried forward, which together amounted to £36,159, or the equivalent of one-and-a-half years' dividend. He thought this was sufficient to meet any variations that might occur.

The motion was unanimously carried.

Moved by Mr. GERALD T. WATSON, and seconded by Mr. JAMES CLOUDSLEY, J.P., dividends were declared at the rates of 6¾ per cent. per annum on the "A" stock and 5¼ per cent. on the "B" stock.

Mr. H. D. ELLIS moved a vote of thanks to the Chairman and Directors. After a few congratulatory and complimentary remarks, he adverted to the Chairman's statement that £22,821 had been expended on capital account during the half year. This, he said, sounded very big; but when they came to compare the capital with the business done, it would be found that the latter had more than responded to the capital expenditure. Indeed the capital per 1000 cubic feet sold was a fraction under 2¾d. per 1000 cubic feet lower than it was in the corresponding half of last year.

Mr. BROWN seconded the motion; and it was heartily agreed to.

The DEPUTY-CHAIRMAN having responded, a cordial vote of thanks was, at his instance, passed to Mr. Broadberry, Mr. Topley, their staffs, and the workmen for their unceasing and untiring efforts in the interests of the Company.

Mr. BROADBERRY, in the course of his acknowledgment, said the pleasure of working for the Company was increased now that all the staff and workmen were partners. The feeling of a divided interest had been wiped away; and the men felt they had something more than a workman's interest in the concern in which they earned their living.

Mr. TOPLEY also replied; and the proceedings terminated.

LIVERPOOL UNITED GAS COMPANY.

A Small Decrease in Consumption.

The Half-Yearly Meeting of the Liverpool United Gaslight Company was held last Tuesday at the Offices, Duke Street—Mr. H. WADE DEACON, the Chairman, presiding.

The CHAIRMAN, in moving the adoption of the report (which recommended dividends for the six months of 5 per cent. on the ordinary consolidated "A" stock and 3½ per cent. on the 7 per cent. "B" stock), said that, as there were no accounts to present, there were no "pegs for him to hang a hat upon." One or two matters of small moment, however, he wished to refer to. The quantity of gas sold during the last six months had been somewhat smaller than during the corresponding period of 1907. Like most other gas companies, they had had rather diminished sales. It was not due, he was glad to say, to a reduced number of consumers, because there were 3690 more consumers in 1908 than in 1907. This was a satisfactory feature of their business; but though they had more consumers, the quantity of gas sold was less by 1·4 per cent. than in the corresponding half year. This was attributable, the Directors believed, largely to bad trade. People had been more economical in the use of gas; but perhaps the reduction was more accounted for by the conditions of the weather. The winter had been, with the exception of one or two short periods, a particularly mild one; and therefore so much gas had not been used for heating and warming purposes. At the gas office, they kept the record of the temperature fairly regularly, to ascertain how matters stood; and for a period of five days, when the temperature was taken, they found that this year the average had been 46·6° Fahr.; and during that time the output of gas was 16⅓ million cubic feet per day. In the corresponding period, the temperature was only 29·2°; and the output was 18 millions per day—a very considerable difference. Another point was the difficulties that all gas companies had to deal with owing to sudden variations of temperature. This year the variations had been rather rapid. Just before Christmas Eve, there were several days of particularly mild temperature; and the Company turned out only about 17 million cubic feet a day. Suddenly, on Christmas Eve, the temperature went down a little bit; but there was always a demand for gas on Christmas Eve, and the Company sold 20 millions that day. Immediately after Christmas, for three days, they sold only 14 million cubic feet, owing to the temperature, as against 20 millions in the corresponding period of the previous year. In spite of these variations, which entailed a good deal of watching and care on the part of the Engineer (Mr. Edward Allen) and those connected with the distribution, they had been able to supply all the gas required without any diminution of pressure or any variation of quality. This ought to be satisfactory to the shareholders; and he trusted it would be equally satisfactory to the public.

The report was adopted; and the dividends recommended were declared.

Mr. HEDLEY inquired whether, seeing there was so much dissatisfaction among working men owing to the upheaval of Socialism, the Company had had any difficulty with their workmen.

The CHAIRMAN: Not the least.

This concluded the meeting.

NEWCASTLE AND GATESHEAD GAS COMPANY.

The Effects of Bad Trade.

The Annual General Meeting of the Company was held last Wednesday, when Sir WALTER PLUMMER took the chair, in the absence through indisposition of Sir W. H. Stephenson and Mr. E. A. Hedley, the Chairman and Deputy-Chairman of the Company.

The CHAIRMAN, in moving the adoption of the report, said the revenue from all sources for the year 1908 amounted to £417,153. Of this, £266,468 was received for gas, £116,563 for residuals, £32,094 for rentals of meters, stoves, and lamps, and £2034 for sundries. The expenditure amounted to £329,818, which left £87,341 as the gross profit for the year; and with the sum of £18,592 brought forward from 1907, they had at their disposal £105,933. After deducting £18,976 paid for interest upon debenture stock and loans, and £43,767 for the interim dividend in August, there was left the sum of £43,260 to pay the second half-year's statutory dividend of £42,712 recommended by the Directors, and to carry forward to the credit of the current year a balance of £547. The revenue was £1098 less, and the expenditure £17,082 more, than in the previous year, and the gross revenue £18,181 less and the interest on debenture stock and loans and the statutory dividend £258 less than the previous year. Residuals had all realized less—partly owing to the decreased carbonization of coal, and partly to the lower values. The decreases were: Coke, £1100; tar, £2534; sulphate of ammonia, £1472. In the aggregate, residuals yielded £5106 less than in 1907. The quantity of gas sold was 2,967,439,000 cubic feet; and, for the first time in the history of the Company, it had shown a decrease as compared with previous years. They sold nearly 61 million cubic feet, or 2·01 per cent., less than in 1907. This, he need hardly say, was entirely due to the long-drawn-out period of depression in trade existing in the district throughout the year, and which was, unfortunately, accentuated by the disputes in the North-East Coast engineering and shipbuilding industries, which lasted from January to September. The cost of coal carbonized during the year proved to be a further and a still more serious difficulty to the Company. Their contracts ran from July 1 to June 30; and they used over 300,000 tons a year. To show how prices had effected their expenditure, he would give them the actual costs for the last three years: In 1906, 295,913 tons cost £128,746; in 1907, 307,818 tons cost £161,337—£32,591 increase over 1906; in 1908, 300,661 tons cost £174,813—£13,476 increase over 1907, and £46,067 increase over 1906. As a set-off to the increased cost in 1907, they had £26,034 better results from residuals, which enabled them to pull through without an increase in the price of gas. Last year, however, there was a further increase of £13,476 for coal, with £5106 less received for residuals. They had earnestly striven to avoid raising the price of gas, and had hopes of doing so until Midsummer. But the coal market continued to be against them; and when they made their yearly contracts in May, they were not able to purchase as cheaply as they expected. Further, the export coke market (and they exported 60 per cent. of their saleable coke) had given way, other residuals were weak, the strike was still going on, the depression still existed, and looked like continuing, while the increased make of gas of 2 per cent. at the end of March had turned into a decrease. The Directors very reluctantly, therefore, came to the conclusion that it was necessary to raise the price of gas 2d. per 1000 cubic feet. It was so raised from the commencement of the fourth quarter of the year to ordinary consumers and public authorities, with the result that the reduced dividend of £4 11s. 3d., as compared with £4 12s. 6d. per cent. (the rate divided during the last 4¾ years), might now be paid without entrenching upon their reserve fund of £60,000. While the last year had been a period during which the Company had suffered severely through circumstances over which they had no control, there were yet some grounds for congratulation. The number of consumers on Dec. 31 was 104,312—viz., 48,856 ordinary and 55,456 prepayment; being increases of 987 and 4641 respectively. Cooking-stoves out on hire numbered 61,089, or an increase of 2804. The issue of gas-fires on hire had advanced steadily; the total being 1748, or an increase of 570. Then 365 new public lamps erected brought the total up to 14,302. The gas consumption was steadily increasing, notwithstanding the mild and open weather of the winter; and he looked forward with the greatest confidence to more than regaining the lost consumption during the current year.

Mr. U. A. RITSON seconded the motion.

Councillor OUBRIDGE pointed to the amount of sulphur in the gas, and said they would be aware that the Corporation had had to complain several times about the purification of the gas. For the sake of the whole town, and speaking as a member of the Corporation and a consumer of gas, he thought the Company should try their utmost to keep the gas as pure as possible.

The CHAIRMAN replied that the Company had never had any intention of saving at the expense of the health of the community; and they did not admit for a moment that any altered methods of purification that they might contemplate putting into operation would be at all damaging to health. They were using the same methods now as they had done in the past.

The report was adopted.

Damages for Subsidence of Reservoirs Caused by Mining.—Mr. Edward Pollock, an Official Referee, was engaged last week upon an inquiry referred to him by an order of the Court of Appeal, affirmed by the House of Lords, to ascertain the extent of the damages sustained by the Manchester Corporation in consequence of the subsidence of the soil caused by the mining operations of the New Moss Colliery Company, Limited, beneath three of their reservoirs. The judgment of the House of Lords, dismissing the Colliery Company's appeal against the decision of the Court below, was reported in the "JOURNAL" for the 10th of March last (p. 637). After occupying the Official Referee two days, it was announced on Friday morning that the parties had agreed to settle the case. The defendants were to pay to the plaintiffs £17,500 as damages, by certain instalments; and an order to this effect was consented to.

WEST HAM GAS COMPANY.

Half-Yearly Report and Accounts.

In the report for the six months ending the 31st of December last which the Directors of the Company will present at the half-yearly meeting to be held to-day, they say they feel assured that the proprietors will share their own sincere regret at the death, on the 1st inst., after only a few days' illness, of Mr. John Clark, and their sense of the loss thus sustained by the Company. Mr. Clark was appointed Consulting Engineer in April, 1892, and Engineer and General Manager on the death of Mr. John Thorman, four years later; and the Directors acknowledge that "his careful and painstaking services throughout his tenure of office have been of great value to the undertaking." They have made satisfactory arrangements for carrying on the business for the present with the assistance of the existing staff. As the proprietors have already been informed by circular, the Directors have entered into an agreement, dated the 16th of December last, with the Gaslight and Coke Company, for the amalgamation of the two Companies, subject to the approval of Parliament. In a memorandum enclosed with the report, and given below, the Directors state their reasons for the steps they have taken. A resolution will be submitted to the meeting approving the action of the Directors; and they hope it will have the support of the stockholders. The reduction of 1d. per 1000 cubic feet in the price of gas, referred to in the last report, came into effect at Michaelmas; and this, combined with the comparatively mild weather this winter, has, of course, adversely affected the rental.

The accounts accompanying the report show that the sale of gas produced £122,909; the rental of meters, stoves, and fittings, £18,873; residuals brought in £24,505; and the total revenue was £166,302, compared with £160,507 in the second half of 1907. The manufacture of gas cost £89,689 (coal, coke, breeze, and oil figuring for £62,107, and repairs and maintenance of works for £15,227); distribution entailed an expenditure of £30,670; management cost £5481; and the total expenses were £135,818, against £128,543. The balance carried to the net revenue account is £30,484, compared with £31,964; and the amount available for distribution is £50,221 (of which £24,405 has been brought forward), against £47,117. The Directors recommend that dividends at the rates of 5 and 5½ per cent. per annum be paid on the preference and consolidated ordinary stocks respectively for the half year. These will amount to £28,766, and leave £21,455 to be carried forward.

Statements relating to manufacture show that 53,506 tons of coal, 873,795 gallons of oil, 8079 tons of coke, and 2511 tons of breeze were used in the production of 989,949,000 cubic feet of coal and water gas, of which 921,594,000 cubic feet were sold and 935,454,000 cubic feet accounted for. The residuals produced in the half year were: Coke, 32,371 tons; breeze, 6882 tons; tar, 730,491 gallons; sulphate of ammonia, 645 tons.

Memorandum on the Proposed Amalgamation.

The following is the memorandum to which reference is made in the Directors' report.

You will notice that at the ordinary general meeting of the Company a resolution will be submitted approving the action of the Directors in entering into the agreement for the amalgamation of the Company with the Gaslight and Coke Company, referred to in the circular of Nov. 19, 1908, addressed to you by the Directors. In asking your support on this occasion, the Directors beg to lay before you the following statement of the proposed terms of the amalgamation, and of the reasons which make them think the proposed course desirable.

The works in West Ham will afford little, if any, room for increased manufacturing plant. We have secured additional land at East Ham for the purpose of establishing a new manufacturing station, upon which a large gasholder has been erected. Up to the present time it has been found possible to avoid erecting any manufacturing plant there; but this cannot be much longer delayed. Further portions of the large area in the Company's district not yet occupied become every year covered with dwellings, which will for a long time continue to provide new customers; and this, with the demand for slot-meter supplies, which shows no signs of falling off, points to a continued increase in the demand for gas that must very soon be met from some other manufacturing station than our existing works at West Ham.

Whenever the step of establishing a new station is taken in hand, an expenditure of capital will be involved, which must be very large, and will probably exceed £200,000; while the increased quantity of gas manufactured must for a considerable time be quite insufficient to produce profits at all in proportion to such capital expenditure. Your Directors have therefore to contemplate in the near future a step that might possibly oblige them for a time to decrease the dividend payable to the stockholders, and to increase the price of gas. The Gaslight and Coke Company, on the other hand, have at their existing works plant and space far more than sufficient to meet the demands likely to be made upon them within their present district, which, if the amalgamation takes place, can be utilized in supplying the additional demands which must arise in this Company's district in the immediate future, without involving any such additional expenditure of capital as we have referred to. When, therefore, the Gaslight and Coke Company approached the Directors with a proposal for amalgamation, it appeared to them that, if terms could be arranged satisfactory to the stockholders, and safeguarding the interest of the consumers, it would be distinctly beneficial to both these classes that the proposal should be accepted; and such terms the Directors believe they have arranged in the agreement they have entered into.

The financial arrangements contained in the agreement which were described in the circular of Dec. 21, 1908, and which may be repeated here, are: Every £100 of consolidated ordinary stock of the West Ham Gas Company will be exchanged for £118 of ordinary stock of the Gaslight and Coke Company; £100 of 5 per cent. preference stock of the West Ham Company will be exchanged for £125 of 4 per cent. preference stock of the Gaslight and Coke Company; and £100 of 4 per cent. debenture stock of the West Ham Gas Company will be exchanged for £133 6s. 8d. of 3 per cent. debenture stock of the Gaslight and Coke Company. These will secure the same dividend and interest to holders of preference and debenture stock now entitled to fixed dividend and interest on their stocks; while their holdings will command a considerably increased price in the market.

The ordinary stockholders become entitled to £118 of a stock standing at the time of the negotiations at about *par*, in place of £100 of West Ham stock, the market price of which was then about £102½, and which has considerably appreciated in value since the proposed amalgamation was announced, and entitling them to anticipate a dividend somewhat more than that which the present price of gas entitled them to anticipate in this Company. The Directors were aware at the time of the intention of the Gaslight and Coke Company to reduce their price to 2s. 9d. on the 1st of January, as they have in fact done. The agreement provides that, if the amalgamation is carried out, the price charged by the Gaslight and Coke Company shall on the 1st of January next be made to correspond with that charged by this Company.

Although no mention of the subject has been made in the agreement, the Directors have throughout been assured that the Gaslight and Coke Company have no intention of closing the present works of the West Ham Company, and that they will be carried on as at present—all the men now employed in the works being taken over by the Gaslight and Coke Company at the date of the change taking place.

The agreement further provides for one Director of the West Ham Gas Company to become a Director of the Gaslight and Coke Company; for compensation to be paid to retiring Directors and to the two Auditors appointed by the stockholders for the loss of their offices; for compensation to officers who shall not be required by the Gaslight and Coke Company, or who, after fourteen years' service in this Company, shall not be willing to enter the employ of that Company—all the other officers being taken over by the Gaslight and Coke Company upon the same terms as to salaries and otherwise as those under which they then held office in this Company; and for the payment of all pensions granted by this Company.

The agreement contains a variety of other clauses ancillary to these provisions, which will, as far as the stockholders think necessary, be stated at the general meeting. The agreement is subject to the approval of Parliament; and the Bill for carrying it into effect will be submitted for the approval of the stockholders at a later stage.

The Directors trust you will approve the action they have taken in the matter, and will give them your support in carrying the resolution which will be submitted to the meeting.

GAS SUPPLY IN NORTH LONDON SUBURBS.

Reductions in Price.

The half-yearly reports of the North Middlesex and the Southgate and District Gas Companies, which have lately come to hand, furnish further evidence of the growth of gas supply in the North London suburbs.

Compared with the latter half of 1907, the sale of gas increased in the case of the North Middlesex Gas Company by 9,122,700 cubic feet, or 10·4 per cent., in the six months ending Dec. 31 last. For public and private use, 96,390,000 cubic feet of gas were sold, producing £17,487 out of the total revenue of £20,981. The manufacture of gas cost £10,507; its distribution, £3127; and management, £1124—the total expenditure being £16,103. The balance carried to the profit and loss account is £4878; and the amount available for distribution £6905. From this the Directors will recommend, at the general meeting of proprietors to-morrow, the payment of dividends at the rates of 5, 10, and 7 per cent. per annum on the preference, original, and additional capital respectively, and the carrying of £473 17s. 8d. to the reserve fund. This appropriation will amount to £3581, and leave a balance, in round figures, of £3324 to be carried forward. The expansion of the Company's business has enabled the Directors to announce a reduction, as from the 31st prox., of 2d. per 1000 cubic feet in the price of gas to the ordinary quarterly consumers.

At the meeting of the Southgate and District Gas Company last Thursday, the Directors reported an increase of 6,334,200 cubic feet, or 9·2 per cent., in the sale of gas in the half year ending Dec. 31. The total quantity sold was 75,218,500 cubic feet, which brought in £13,815; the sale of residuals produced £1793 (a slight increase); and the total revenue was £16,810. The expenditure having been £12,714, there was a balance of £4096 to be carried to the profit and loss account. The amount available for distribution was £5469; and the Directors recommended the declaration of dividends at the rates of 5, 10, and 7 per cent. per annum on the preference, original, and additional capital respectively. These would absorb £2637, and leave £2832 to be carried forward. The Directors made the gratifying announcement that the enhanced cost of coal, oil, &c., to which reference was made in their report this time last year, had been met without raising the price of gas, and that they purposed reducing it by 2d. per 1000 cubic feet as from the 31st prox. The increase in the business has made it necessary to provide additional manufacturing plant; and the work of building a new retort-house has been commenced. Reference was made by the Directors to the loss sustained by the Company by the death of the Deputy-Chairman, Sir Ralph Littler, on the 23rd of November last, which, they said, had deprived them of a "much esteemed colleague, and the Company of a most valued Director," whose great talents and exceptional experience were at all times at their service.

Stoking Machinery for Ilkley.—A Local Government inquiry was held last week respecting an application by the Ilkley Urban District Council for sanction to borrow £5700 for the purpose of providing mechanical stoking machinery at the gas-works, and also removing the plant for lighting the Town Hall and Free Library with electricity from the Town Hall to the gas-works. Mr. J. W. Benson (the Chairman of the Gas Committee) stated that the gas undertaking was very successful; an average of £1000 having been transferred annually in relief of the rates, besides £2500 per year having been paid off in interest and in reduction of loans. There was no opposition.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

Final Meeting—Compensation of Directors and Staff.

The General Meeting of the Company was held last Tuesday for ordinary purposes and for considering various matters connected with the voluntary winding up of the Company, on the transfer of the undertaking to the Municipality—Mr. F. W. BLUNT in the chair.

The SECRETARY (Mr. W. B. Peat) read the notice convening the meeting. The report of the Directors and the statement of accounts were taken as read.

The CHAIRMAN said if any of the shareholders happened to have in their hands the report of the Directors to the annual meeting held a year ago they would see that the profits for 1908 differed by less than £20 from those of the preceding year. This being the case, there would be practically nothing to dwell upon in the past year's accounts if this were an ordinary meeting in every sense of the term. But in the peculiar circumstances in which they met that day, he thought he might leave the accounts now presented to speak for themselves. The profits being the same as last year, the Board had considered it the proper course to recommend that the same dividend and bonus be paid to the proprietors. He moved the adoption of the report and accounts.

Mr. W. R. GALBRAITH seconded the motion.

Mr. A. J. DAY wished to raise an objection to the report and the accounts. He was much surprised that so little interest was taken in the meeting. It seemed to him that this was a vital one—not only because of the Company coming to an end, but on account of the proposal of the Directors to vote away the shareholders' money in a most improper manner.

The CHAIRMAN: If you are referring to the subject of the allowance to the Directors and the staff ——

Mr. DAY said at the moment he was objecting to the amount of the bonus. The Board proposed a bonus of 5s. per share.

The CHAIRMAN: The bonus of 5s. per share is a supplementary dividend; and it has been the custom for several years past to declare a dividend, and so much bonus from the profits of the year.

Mr. DAY remarked that he proposed that the bonus should be 30s. per share; and that this should come out of the £15,000 referred to in the third matter to be brought forward for consideration.

The CHAIRMAN said he was afraid the Articles of Association did not allow the declaration of a larger dividend than the Directors recommended. He did not know how Mr. Day would manage a bonus of 30s. per share in addition to the 7 per cent. dividend for the year.

Mr. DAY replied that a bonus of 30s. would represent £11,250. The Directors had already provided for a bonus of 5s., amounting to £1875, so that this left the sum of £9375. When they reached resolution No. 3, he should propose that the sum be provided out of the £15,000 which the Directors had voted for themselves and the staff.

The CHAIRMAN observed that the Directors had not voted themselves or the staff any sum; and it was not correct to say so.

Mr. DAY thereupon proposed, and Colonel MONTAGU DAY seconded, an amendment that a bonus of 30s., instead of 5s., be paid.

The CHAIRMAN said he did not think Mr. Day quite realized the position. There were, in connection with the winding up, a number of things to be done, and a number of liabilities to be met, quite apart from the allowance to the Directors or staff. In the opinion of the Directors, it would not be prudent or proper to divide every penny up to the hilt. Under the Articles of Association, it was for the Directors to declare a dividend. They had to obtain the sanction of the general meeting to the dividend so declared; but it did not give power to the general meeting, in face of the Directors' recommendation and decision, to vote anything of which the Directors did not approve. There were considerable expenses to be dealt with; and there was, of course, the uncertainty as to the surplus assets beyond the actual amount the Municipality had to pay, and the reserve funds the Company had invested. It would not therefore do, in the opinion of the Directors, to distribute anything more than they had recommended.

Mr. WENTMORE said the Directors proposed to carry forward £10,243. Did they propose to distribute this in the shape of further dividend? He asked this because he was there as one of a set of trustees; and the beneficiaries would be entitled to the money as dividend, but in the guise of capital they would not be.

The CHAIRMAN said that was a perfectly fair question; and it touched a point of which the Directors had not lost sight. The advice the Directors received from Counsel was that there was nothing in the Articles of Association that necessitated the distribution of all the profits by way of dividend. For many years past they had not been so distributed; and Counsel thought it was not right to interfere with the Directors' discretion to keep in hand a fund until the actual winding up took place. He was proud to say that, in the ordinary course of things, this money would go in augmentation of the capital return on the shares.

Mr. G. F. THOMPSON said he understood that what balance there was, after the requirements were all satisfied, would still come to the shareholders. They had only to pass the report; and if there was any balance, it would reach the shareholders in due course.

Mr. DAY intimated that he would deal with the matter further on the third resolution.

The motion was then carried.

Proposed by the CHAIRMAN, and seconded by Mr. GALBRAITH, the interim payment on account of dividend was confirmed; and a dividend for the half year to Dec. 31 last at the rate of 8 per cent. per annum, and a bonus of 5s. per share (equal to 1¼ per cent.), both less tax, were declared.

The CHAIRMAN said he now came to a subject which required rather more explanation. The proprietors had received a full report of what took place at the meeting on Jan. 19. It was then intimated and accepted in principle by the proprietors that, in connection with the pending sale of the Company's undertaking, some allowance or compensation should be made to the Directors and to the staff. No figure was suggested; but so far as the conversation went, a suggestion seemed to be invited from the Board. The feeling of the Board when they came to consider the subject was that whatever was done should be suggested and done by shareholders, who should be asked to appoint a small Committee to consider the matter, and take such action upon it as they thought proper. The Board were, however, advised by Counsel, through Sir Francis Palmer, that whatever appropriation of funds for these two purposes was made must be arranged before the Liquidators were installed in office, and consequently must precede this meeting, and should be ratified by the meeting. In order to fulfil these somewhat inconsistent conditions, Counsel suggested the agreement now to be submitted, and which appropriated, for the purpose of an allowance to the Board and compensation to the staff, a maximum amount which was to be at the disposal of the Shareholders' Committee. The Committee would be in no way bound to apply the whole amount thus set aside in making allowances and compensation, but would consider the claims of the Board and of each member of the staff, and deal with them as they thought proper, while not exceeding five years' salary as a maximum in any case. Whatever sum might remain unapplied would revert to the Liquidators, and through them to the shareholders. As Mr. Day would see, the agreement did not appropriate by the Directors any particular sum either for the staff or still less for themselves. But it put the power into the hands of the Committee of Shareholders (to be elected at a future time) the making of such allowance as they thought right and fit to the staff or to the Board. He (the Chairman) certainly relied much more particularly on consideration for the staff. The bulk of the staff were men whose occupation and sole livelihood depended upon the Company; and the shareholders present would agree with him that in the case of a Company selling, and selling at an advantageous price, its undertaking, which had hitherto formed the livelihood of a certain number of clerks and others, it was just, usual, and universal to make some arrangement of the kind for compensating them for the loss of their position in life. One of the most recent cases that occurred to him was one that had been sanctioned by Parliament, where very ample provisions were made for the compensation of persons disturbed from their livelihood. That was in the Port of London Act. And as to the Directors, there were also provisions for making compensation to them. It was usual, and shareholders generally liked to have an opportunity of testifying their *reconnaissance* to Directors who had managed their affairs for several years. Unfortunately, the Chairman of the Company (Sir John Aird) was very ill; and therefore the Directors had only been able to have indirect communication with him. From the first, however, he had been of opinion that there should be no question of consideration for the staff or the Board until the money was in hand, and until they knew there would be fairly available, after payment of all prior claims, the sum which anyone might suggest was right to be distributed in the way of allowances or compensation. In a letter Mr. Peat had received from Sir John, he expressed the opinion that this subject should stand over until the money was actually received. As, however, he (the Chairman) had explained, it was quite impossible, from the legal point of view, that it could be dealt with at all if the agreement was not ratified before the Liquidators actually commenced work. The Board therefore proposed to meet Sir John's views and the legal necessities of the case, by submitting the agreement for ratification, and then to leave over the question of the appointment of the Committee of Shareholders.

The SOLICITOR having read the agreement,

The CHAIRMAN moved the ratification of—

The provisional agreement dated the 16th day of February, 1909, and made between the Company, of the one part, and Sophus Simmelkjör, on behalf of the Directors and staff of the Company, of the other part, being an agreement for setting aside and applying a sum not exceeding £15,000 out of the surplus assets remaining—after paying or providing for the payment of £26 per share to the shareholders, and all debts and liabilities, and the costs of winding up—and for the payment thereout to each Director and to each member of the staff of such sum, not exceeding five years' salary, as a Committee of Shareholders shall think proper, on the footing that the payment shall be in full satisfaction of all claims for compensation, loss of office, special services or otherwise, and any surplus to revert to the Liquidators for distribution as part of the general assets of the Company.

Mr. GALBRAITH seconded the motion.

Mr. FLETCHER made a number of suggestions as to the lines on which the compensation and allowances should be made.

The CHAIRMAN pointed out that these were the very points that were to be left to the determination of the Committee of Shareholders; and so he respectfully suggested that these views should be reserved for the Committee when called into existence.

Mr. DAY thought that five years' remuneration was most excessive; and it seemed to be assumed that the employees were not likely to get employment for that period. He was quite with the Directors in giving fair compensation; but he regarded the proposal to divide the equivalent of one-tenth of the capital among the staff and others as a really preposterous one. He should therefore propose that the £15,000 be reduced to £5000.

The CHAIRMAN said they could not at this meeting cut the agreement about. They must either adopt or reject it.

Mr. DAY: Then I am afraid I shall have to take some other action.

The CHAIRMAN pointed out that there would be ample time for the giving of instructions when the Committee were appointed. Until the Committee were appointed, there was no one to instruct or regulate by any resolutions passed now. On the appointment, if thought desirable, a resolution could be passed instructing the Committee to distribute £5000 at the most.

After further remarks, the agreement was ratified.

Moved by the CHAIRMAN, and seconded by Mr. A. G. BURNEY, the resolutions passed at the meeting on the 19th ult. were confirmed.

The CHAIRMAN, replying to Mr. Thompson as to whether the settlement with the Municipality would be carried through promptly, said that unfortunately the Italian Parliament had been dissolved; and he understood the election of new members would not take place until next month. There would therefore be rather more delay than was anticipated at the last meeting in getting the Act passed. Nevertheless, the Board believed the Municipality were prepared with the money; and, so far as the Company were concerned, they would be prepared to sign the agreement, and hand over the works in exchange for the money. The Municipality had borrowed the money from the bank, and would be paying interest on it from the 23rd of this month.

Mr. SIMMELKJOR observed that it would be to the interest of the Municipality to get the Company to take the money as soon as possible, for they were, by the contract, obliged to pay the Company interest.

The resolutions were then confirmed.

The CHAIRMAN said he should like to be allowed to say a word or two more before he left the chair, as this was the last meeting that would be called by the Directors. Their duties were now at an end; and the affairs of the Company fell into the hands of the Liquidators. He thought the shareholders might like to know something as to the progress of the Company during its history. The capital was now the same as it was forty years ago—viz., £150,000. During the same time, the Company's receipts (for gas and water) had increased from £12,267 to about £30,000, and the profits from £6799 to about £15,000. It had been the custom at all general meetings of the Company for the shareholders, in their kindness and good pleasure, to carry a vote of thanks to the Directors. As it had fallen to his lot to preside at this the last general meeting which it had been the duty of the Board to convene, he must ask the shareholders to let him turn the tables, and take the opportunity of tendering to them the very grateful thanks of the Board for the unvarying confidence that the shareholders had reposed in them. The conduct of the undertaking had happily not been unsuccessful. But it had been enormously facilitated by the certainty felt by the Board that their policy would always, in case of need, be endorsed by the shareholders; and that certainty had in turn acted as a stimulus to the Board to do their very best at all times for the success of the Company. The Directors thanked the shareholders, and bid them regretfully farewell.

Proposed by Mr. THOMPSON, and seconded by Mr. WENTMORE, a cordial vote of thanks was passed to the Chairman and Directors, and officers and staff for their good services.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report that the Directors of the Commercial Gas Company will present at the half-yearly meeting on Thursday.

The revenue account shows a net profit for the half year of £63,845 19s. 2d., which, added to the balance of £18,488 11s. 11d. brought forward, produces a net revenue balance of £82,334 11s. 1d. Deducting therefrom £8521 0s. 5d. for interest, there remains standing to the credit of the net revenue account a balance of £73,813 10s. 8d. available for dividend. The Directors recommend the payment of dividends at the rates of £5 4s. per cent. per annum on the 4 per cent. stock of the Company, and of £5 per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year. To meet the requirements of the Company, further capital will be necessary; and a resolution will be submitted to the proprietors authorizing the raising of additional capital, in conformity with the Company's Act of 1902.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on the 31st of December amounted to £976,405; that £1,076,875 had been added by conversion, making £2,053,280; and that £170,698 remained unissued out of the total authorized capital (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,584,665 4s. 5d. The expenditure stands at £1,426,529 1s. 9d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,639,341 11s. 9d. There is consequently a balance of £54,676 7s. 4d. carried to the balance-sheet. The expenditure on capital account in the half year was £7315, apportioned as follows: New and additional mains, services, &c., £2133; stoves, £2030; prepayment meters and fittings, £3152. The reserve fund amounted at the close of December to £35,869; and the insurance fund to £34,101. The following is the

REVENUE ACCOUNT.

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£102,900 3 0		
Salaries of Engineer and officers at works	2,248 1 0		
Wages (carbonizing)	16,210 10 6		
Purification, including labour	1,512 14 7		
Repair and maintenance of works and plant, materials and labour, less £306 17s. 2d. received for old materials	24,589 15 9		
		£147,461 4 10	
Profit sharing		2,799 13 3	
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£3,927 8 6		
Repair, maintenance, and renewal of mains and services, material and labour	5,849 18 5		
Repair and renewal of meters	3,059 12 7		
" " " " stoves	7,009 6 7		
" " " " prepayment meters and fittings	9,152 13 1		
Incandescent mantle maintenance	520 14 10		
		29,519 14 0	
Public lamps—lighting and repairing		2,542 0 9	
Rent, rates, and taxes		12,387 9 8	
Management—			
Directors' allowance	£1,250 0 0		
Company's Auditors	75 0 0		
Salaries of Secretary, Accountant, and clerks	1,189 1 2		
Collectors' salaries and commission	1,652 7 9		
Prepayment meter collection	2,712 12 10		
Stationery and printing	947 6 10		
General charges	1,718 9 11		
		9,544 18 6	
Bad debts		1,163 14 9	
Law and parliamentary charges		380 2 5	
Superannuations and allowances		1,218 4 10	
Official officers, &c.		100 3 10	
Total expenditure		£207,117 6 10	
Balance carried to net revenue account		63,845 19 2	
		£270,963 6 0	

Receipts.

Sale of gas—			
Common gas per meter at 2s. 6d. per 1000 cubic feet (91,650)	£191,581 12 5		
Public lighting and under contracts, common gas	5,750 3 7		
	£197,331 14 0		
Less discounts and allowances	3,110 4 8		
		£154,221 9 4	
Rental—			
Meters (23,754)	£2,838 5 5		
Stoves (55,066)	8,919 19 2		
Prepayment meters (67,170)	13,337 0 7		
Incandescent mantle maintenance	471 6 6		
		25,565 11 8	
Residual products—			
Coke, less £3826 12s. 8d. for labour	£33,479 5 6		
Breeze, less £1112 13s. 7d. for labour	2,407 0 3		
Tar	6,368 19 0		
Ammoniacal liquor and sulphate of ammonia	8,867 15 3		
		51,123 0 0	
Miscellaneous receipts—			
Rent receivable	£17 0 0		
Transfer fees	35 5 0		
		52 5 0	
Total receipts		£270,963 6 0	

The following are the statements relating to the manufacturing operations of the Company in the half year:—

Statement of Coals and Oil.

Description of Coal.	In Store June 30, 1908.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store Dec. 31, 1908.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	27,713	99,485	101,417	522	25,259
Cannel	522	..	157	..	365
Total	28,235	99,485	101,574	522	25,624
Oil—gallons	241,917	1,369,772	1,244,764	..	366,925

Statement of Residual Products.

Description.	In Store June 30, 1908.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1908.
Coke—tons	5,249	62,214	13,541	42,113	11,805
Breeze—tons	5,659	12,463	..	11,694	6,428
Tar—gallons	595,525	1,225,390	..	1,232,085	588,830
Ammoniacal liquor—butts of 108 gallons	6,453	32,565	32,560	..	6,458
Sulphate of ammonia—tons	95	995	..	840	250

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,699,754	37,020	1,534,393	1,596,909	3915

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, oil, &c., £23,389; coke and breeze, £8515; tar, ammoniacal liquor, sulphate of ammonia, &c., £8989; sundry stores, £34,969—total, £75,892. The figures this time last year were: Coal, oil, &c., £25,682; coke and breeze, £5215; tar, ammoniacal liquor, sulphate of ammonia, &c., £9003; sundry stores, £35,044—total, £74,944. A sum of £16,956 stands in the balance-sheet as employees' bonus and savings, compared with £13,568 at the end of December, 1907.

BOURNEMOUTH GAS AND WATER COMPANY.

Prosperous Position—Co-Partnership Scheme—Income-Tax on Fees and Salaries.

The Ordinary General Meeting of the Company was held on Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. William Cash, F.C.A.) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN said it was his pleasure to once more place before the proprietors the report and balance-sheet for another half year. The two points to which he wished specially to draw attention were the admirable recovery the finances had made after the very large reduction in price of gas that was announced at the last meeting, and the happy and safe inauguration of the co-partnership scheme to which the proprietors gave their sanction at the extraordinary meeting of which the minutes had been read. With regard to the finances, fortunately he need not say much, because they spoke for themselves. The Board had looked forward to a reduction in revenue of £7500 a year in consequence of the 3d. reduction in the price of gas for lighting. When he told them that in one of the heaviest quarters of the year—from Michaelmas to Christmas—which was the period during which the reduction had been in operation, the actual reduction had been only £426, it would be seen what a splendid recovery the Company had made. Although he did not like to prophesy unless he knew, he thought he might say that, if they went on increasing at the present rate, they would, by the time he again addressed the proprietors, have

recovered the revenue altogether, and have got back to their old standard without the reduction of the price being felt in any shape or form. This recovery so far had happened in a half year that had not been a very grand one for gas companies, owing (he was going to say) to the absurd and ridiculous mildness of the weather. The weather was such that, while it was very good as an advertisement for a health resort such as Bournemouth, it was not so satisfactory from the point of view of the Company. In spite of this, the increase in the sale of gas was 3·77 per cent., which, he thought, was very satisfactory, although it was not such a high increase as they had been accustomed to in some of their good past half years. The proprietors might, however, take it from him that in Bournemouth, gas was now as popular as ever—whether for lighting, heating, cooking, or power. Indeed, it was the marvellous capacity that they had in these four different directions that enabled them, from half year to half year, to present such excellent reports as they were enabled to do. There had also been the satisfactory increase in the water-rental of £842. It was proverbially unnecessary to paint the lily or gild refined gold. Therefore he would leave the accounts with these comments, congratulating the proprietors, as he had had the pleasure of doing in the past, on the satisfactory way they were able to carry on the work at Bournemouth. This brought him to the co-partnership scheme, about which the proprietors heard at the last meeting. He (the Chairman) had great pleasure in going to Bournemouth to start the scheme on behalf of his colleagues, and as the representative of the proprietors. They had a meeting of the whole staff—with the exception of a few who had necessarily to remain on duty—from the General Manager (Mr. Harold W. Woodall) down to a young lad who joined the Company only a week before. It was the most remarkable gathering that he certainly had ever had the honour of addressing. He did not think he had ever felt himself addressing a more interesting or more interested gathering than on that occasion. It was perfectly astonishing to see the attention with which he was followed in unfolding very briefly the idea of the scheme, and the vigorous, virile way in which the men took his explanations, because he was perfectly frank with them. He explained to them that the Company were not going to give these increased funds merely to increase their remuneration; that they were giving the additional money not to spend, but to save, with a view of giving them a real earnest and a sound interest in the undertaking. The way in which they accepted his words was of a remarkable character. The scheme was received with an absolute unanimity and great enthusiasm. At the close of his speech he invited questions; and with all the eagerness of an old parliamentary candidate, he really looked forward to a little heckling. But the men understood exactly what they were about; and they seemed to appreciate, too, what was going to happen. The only matter of interest that arose, and which he left untouched in his speech, was as to whether ladies could join in the scheme. Of course, if they had lady lecturers, or collectors, or canvassers, they would undoubtedly have as much right to join the scheme as co-partners as anybody else. He was going down to Bournemouth the following week by the invitation of the General Manager and the Chairman of the Co-Partnership Committee, to actually carry out the first half-yearly meeting. There were no financial results at present. But they were putting by, as would be seen from the accounts, £574 towards the scheme and the expenses of starting it. But the financial arrangements would, of course, come afterwards. They could not expect anything very great at present. Competition between gas and electricity still went on brightly and vigorously—even in Bournemouth. The General Manager the other day sent him some very lively pictures that had been scattered all over Bournemouth, showing the advantages electricity had as against gas. With accounts like the present, and with the work the Company were doing in Bournemouth, he thought they could laugh with their electrical friends, and almost laugh at them. It was his (the Chairman's) misfortune to spend the previous week in bed; and it was his good fortune to have a small gas-fire in his room. And he could assure the proprietors that the comfort, cleanliness, and saving of labour, and the power in his hands of adapting the temperature of the room night and day, were so great that it almost reconciled him to a nasty attack of influenza. While they were going on as at present, the placards of their electrical friends could remain up in Bournemouth for the amusement of the children and others who might be amused by seeing them. There was only one other matter, and that was a personal one. It would be noticed that the question of the remuneration of the Directors was coming before the meeting. It was a good many years now—some ten or twelve years—since the proprietors were troubled at all in this matter. And they would not be troubled now, if it had not been that another matter which required adjustment was to come up, and which they, as a Board, felt must be laid before the proprietors, in order that it might be set right. It had been an absolute rule and the custom since the foundation of the Company to pay income-tax on all the remunerations and all the salaries. The income-tax had been paid *en bloc*; and the remunerations and salaries had been paid clear of income-tax. In looking at the matter, however, they found that, so far as the Directors, the Secretary, and the Auditors were concerned, the resolutions never stated, as the proprietors had passed them, that they were to be paid free of income-tax. The consequence was that, although the Company had been doing this ever since the beginning, it had been done without, technically, the authority or assent of the proprietors. The moment they discovered this state of things, the only thing to be done in the matter was to leave themselves entirely in the hands of the proprietors, and ask them to pass a resolution that would give absolution and put the Directors straight in the matter. In conclusion, he asked the proprietors to accept and adopt the report; and he congratulated them on the very strong and firm position that the concern held.

Mr. CORBET WOODALL, in seconding, remarked that the accounts were about the very best that had ever been presented to this prosperous Company.

Mr. A. B. BOSHER congratulated the Directors on the excellent report. From the North Country point of view, they believed in profit-sharing. He was therefore glad the Company had taken courage in both hands, and had instituted this system. He believed it would turn out one of the most desirable things that had ever been instituted not only in gas companies, but in every other manufacture. So long as they were content to have the confidence of their workmen, believe in that confidence, and repay it, they were doing that which would be in the end to the best interests of the Company. He was a shareholder in several colliery companies; and he thought it might perhaps be of some little interest to the Board to know that he had been speaking to the Managing-Directors of two or three of the Colliery Companies with whom he was connected; and their opinion was that coal had gone down to about its bottom price. Two of them went so far as to say that, rather than work the pits and sell the coal at lower prices than to-day, they would be inclined to bind themselves together and restrict the production to a large degree.

The motion was unanimously carried.

Moved by the CHAIRMAN and seconded by Mr. R. HESKETH JONES, dividends were declared for the half year at the rates of 6, 7, and 14 per cent. per annum respectively on the preference, "B" ordinary, and original shares.

Proposed by the CHAIRMAN and seconded by Mr. F. G. BARRETT, Mr. Hesketh Jones, the retiring Director, was re-elected.

Mr. ARTHUR WOODS then moved—

That all payments of income-tax assessable on the Directors and Secretary's remuneration, heretofore made or authorized by the Board out of the funds of the Company, be and the same are hereby approved, and confirmed, and that the Board be, and they are hereby authorized, to continue to pay out of the funds of the Company all income-tax assessable on any remuneration henceforth payable to any Director or the Secretary for the time being of the Company.

Mr. E. L. BURTON, in seconding, said he was identified with several companies where this procedure was followed, and had been followed for some time past. He looked upon it as quite ordinary procedure that the income-tax should be paid.

The motion was unanimously carried.

Mr. R. H. GLEN proposed, and Mr. BOSHER seconded, the reappointment of the retiring Auditor (Mr. J. C. Benwell).

On the motion of Mr. WOODS, seconded by Mr. R. H. GLEN, the fees of the Auditors were increased by 20 guineas each per annum.

Mr. WOODS said the Directors had not had an increase in their fees since 1896, since which time they had received £1250. They had since taken over the Poole works. The capital had increased from £333,000 to £728,000—more than double; and the gross revenue had increased from £72,000 to £172,000. His proposal was that, from Jan. 1 last, the fees be increased from £1250 to £1500.

Mr. BURTON seconded the motion, remarking that the £1500 was a modest amount compared with the fees paid to the directors of some gas companies he knew of. They must also have regard to the *personnel* of the directorate.

Mr. BOSHER gave his support.

Mr. W. H. CLARKE said he found the four Directors were receiving £312 10s. each a year; but he found that in the Commercial Gas Company, with a turnover of over half-a-million, the Directors got £360 apiece, which was practically the amount it was proposed to give their own Directors.

Mr. BENWELL said he was connected with a number of gas companies. He could mention one where the make was only 300 millions; and the Directors' fees there were £1500. He could mention another where the make was just over 200 millions; and the Directors' fees were £1200.

Mr. BURTON observed, in regard to Mr. Clarke's remarks, that they should regulate the fees by the standard of the companies paying adequate fees and not by those paying inadequate ones.

The motion was carried, Mr. Clarke remarking that he had no feeling in the matter at all.

The CHAIRMAN acknowledged the generous way in which the proprietors had dealt with the Directors on this occasion and previously. Before concluding his remarks, he proposed a vote of thanks to the General Manager (Mr. Woodall) and to the Secretary (Mr. Cash).

Mr. R. HESKETH JONES seconded the motion, which was heartily agreed to.

Mr. WOODALL, in reply, said he was glad the proprietors were satisfied with the way matters were progressing at Bournemouth. With reference to the Chairman's remarks as to gas-fires, it might be interesting to the proprietors to know that, during the half year, the Company sold 461 gas-fires in Bournemouth, which was effecting a new sort of business, because they used to have to tempt people to have gas-fires, by letting them out on hire at cheap rates. They now sold three fires to every one let on hire. The same thing could not be said of gas-cookers. They sold 90 during the half year. In 54 cases they had fitted up gas water-heaters to the water-circulating system of houses. He observed that now the fact that they were a gas company seemed to be almost the only thing that was noticed. The fact that the water part of the undertaking was so much in the background must be to the satisfaction of everybody, because it proved what ample sources of supply the Company had, and what an excellent supply they were able to give to the town. If it were not for this, the Company would hear a great deal about it.

Mr. CASH, in also acknowledging the vote, mentioned that the water-rental for last year showed an increase of £1700. This was a substantial increase in what was after all in one sense the backbone of the Company. When the water-rental was increasing in this way, it meant that building was going on in their area of supply.

A vote of thanks was passed to the Chairman and Directors, on the motion of Mr. CLARKE, seconded by Mr. H. R. GLEN.

Last Wednesday night, South Shields was considerably inconvenienced as the result of an explosion at a manhole in connection with the Corporation electric mains in West Holborn. The cover was blown out; large pieces of concrete and portions of the pavement being shot into the air. Fortunately no one was struck; but a man who was passing at the time received a severe shock, while the manager of a neighbouring shop, on running into the street, fell into the manhole, and sustained injury to his leg. The whole of the arc lamps in the town were extinguished; and the incandescent electric lights were also affected.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

Result of Encouraging Consumption in Chester.

The report presented at the half-yearly general meeting of the Chester United Gas Company on Monday last week set forth that the balance to the credit of the profit and loss account, after payment of interest on the debenture stock and the dividend on the preference stock to Dec. 31 was £4203; and the Directors recommended the payment of a dividend on the ordinary stock in respect of the past half year at the full statutory rate of 2½ per cent. The accounts accompanying the report showed that the revenue in the half year amounted to £20,956, compared with £20,794 in the corresponding period of 1907; while the expenditure was £15,228, against £15,325—the amounts carried to the profit and loss account being £5728 and £5469. In moving the adoption of the report, the Chairman (Mr. J. C. Frost) said that, reviewing last year as a whole, it had been a good one for the Company; and many new records had been achieved. The sale of gas exceeded that of 1907 by 3⅛ million cubic feet; and the sale in 1907 was itself a substantial increase over any previous year. The quantity of gas sold per ton of coal used was 10,492 cubic feet, which was a very good average, and was the best return they had yet had; while the quantity of gas unaccounted for had come down to 4·85 per cent. of the make. This was quite a low figure; but they were hoping to improve upon it. Though coal cost £800 more in 1907, the Directors had been fortunate in the sale of coke; so that in spite of a slightly decreased return from the other residuals—tar and sulphate of ammonia—the cost of coal, after deducting all the receipts from residuals, had been only £90 extra. They had increased the number of consumers by the addition of 28 ordinary and 462 prepayment meters; bringing up the grand total to 8548 meters, which compared favourably with any town in the kingdom with a similar population. The number of cookers and stoves belonging to the Company, and attached to these meters, was 6109; being an increase during the year of 348. In addition, there were several hundreds in use which had been bought by consumers on the hire-purchase system, of which the Company had no record. The average consumption by prepayment meters had been 12,700 cubic feet. These results, he was sure, would appeal to the proprietors as being very satisfactory, and fully justified the policy adopted for many years past in using every effort to encourage the use of gas for those domestic purposes for which it was so particularly adapted. He need hardly now refer to the incandescent gas-light. The proprietors were all aware of the improvements which had been made of late years; and the Directors were continually asked to undertake new installations. By its use, and with regular attention, the most perfect artificial light could be obtained at the least cost. Mr. R. L. Barker seconded the motion; and it was carried unanimously. The dividend recommended having been declared, the retiring Directors and Auditor were re-elected, and a vote of thanks was accorded to the Chairman, Directors, and staff; special mention being made of the services of the Engineer and Works Manager (Mr. J. C. Belton), and the Secretary and General Manager (Mr. F. A. Pye).

Increased Business and Enlarged Works at Felixstowe.

At the annual general meeting of the Felixstowe Gas Company on the 13th inst., the Directors reported that the result of the past year's working showed a large increase in the manufacture and sale of gas, and that more than 100 new consumers had been added to the books. The growth of the Company's business had necessitated a rearrangement of, and additions to, the works and plant; and a start had been made by the erection of a new building for the accommodation of engines, exhausters, &c. Last October the Directors offered the consumers a special discount of 5d. per 1000 cubic feet where gas was used for heating purposes, which it was hoped would encourage the use of gas-fires to a much larger extent than formerly. The revenue account, after placing £70 to the renewal fund, showed a profit of £2063; and the Directors recommended dividends at the rates of 12 and £8 8s. per cent. on the "A" and "B" stocks; making a total distribution for the year of 10 and 7 per cent. respectively, both less income-tax; and leaving a balance of £947 to the credit of profit and loss account. The Chairman (Mr. S. Alexander), in moving the adoption of the report, gave a short *résumé* of the year's trading, which he pronounced eminently satisfactory. He stated that the increase in the make of gas over the preceding year had been 3 million cubic feet. Comparing the statistics of the Company in 1908 with those of ten years ago, he showed that the undertaking had doubled in size and income; and he attributed this largely to the perseverance and skill of their energetic Engineer and Secretary (Mr. Frank M. Paternoster). Mr. Ash (a stockholder) drew attention to the question which was now before the town—that of the Council buying out the Electric Light Company and installing new electric lighting plant; and he reminded the Directors that they would have to encounter in the near future a strong opponent in the shape of the new metallic filament electric lamp and the improved methods of electric heating. The Vice-Chairman (Mr. E. H. Woodmaney), in seconding the motion, expressed his opinion that the Company had nothing to fear from the opposition of the Electric Light Company or any other illuminant or heating power of the future; and he mentioned that the confidence the public had in the future prosperity of the Gas Company was evidenced by the fact that the last sale of "A" stock was effected at a premium of 100 per cent. He added that he was very pleased with the work done by their Engineer and Secretary, and especially with the strong line he maintained when dealing with individuals and corporate bodies who were inclined to treat gas companies more as charitable institutions than as business concerns, and expected much more than they were entitled to receive. The motion was carried unanimously. Messrs. Samuel Alexander and Worthington Church having been re-elected Directors and Mr. I. L. Ensor Auditor, the fees of the Board were increased by £50 per annum, and the number of Directors reduced from six to five. Votes of thanks to the Engineer, foreman, and staff generally, and to the Chairman, brought the meeting to a conclusion, and signalized the close of the most successful year the Company have ever had.

Mr. Ruggles's Record at Leighton Buzzard.

The report which was submitted at the annual meeting of the Leighton Buzzard Gas Company last Wednesday, stated that the revenue account showed a profit for the year to Dec. 31 last of £1948. This amount, with £773 brought forward from last year's accounts, made a balance of £2721 standing to the credit of the profit and loss account. Out of this sum, the Directors recommended the payment of dividends at the rate of 10 per cent. per annum on the original stock and 7 per cent. per annum on the new ordinary stock, less income-tax, together amounting to £1732; and that £300 be carried to the reserve fund, leaving a balance of £689 to be carried forward to next year's account. The Chairman (Mr. R. Richmond, J.P.), in moving the adoption of the report, mentioned that this year Mr. Ruggles completed 25 years of service with the Company. Mr. Ruggles's 25 years' record was a matter of congratulation, because the Company and the consumers of gas were alike in a considerably better position than they were a quarter-of-a-century ago. He noticed that, while the price of coal had increased 26 per cent., the price of gas had decreased about 28 per cent. Thus, whereas the cost of coal had gone up nearly 5s. a ton—viz., from 13s. to its present price of 17s. 7½d. a ton—the charge for gas had been lowered from 4s. 6d. to 3s. 3d. per 1000 cubic feet, and for motive power to 2s. 3d. per 1000 cubic feet. He thought that this was a matter for satisfaction to them all, appealing as it did to them as shareholders and as users of gas. He added that he was sorry the Company could not continue to increase the dividend; but they had got to the limit, and they would have to be satisfied as shareholders. The balance was quite as good as in former years, and required no special comment.

Jubilee of the Longwood Gas Company.

The annual meeting of the Longwood Gas Company was held last Thursday, when the adoption of the report was moved by the Chairman, Mr. Robert Thornton. This stated that the amount expended on capital account during the year had been £2021, of which £1491 had been expended on extensions to works, including the duplication of the steam-raising plant, with new boiler-house, setting, and chimney, the conversion of generative to regenerative settings, enlargement of subway, provision of bye-pass main, valves, and retort-house governor, and part construction of additional accommodation for coke storage. During the year half of the retort-bench had been entirely rebuilt, the sulphate plant had been overhauled, and a new saturator provided. Lime grinding apparatus had been put down, and an enlarged weighing machine, suitable for motor-waggon traffic, provided. The quantity of gas sold during the past year was 102,410,400 cubic feet—an increase on the previous year of 2,257,600 cubic feet, or 2·25 per cent., which, considering the industrial depression, was regarded as satisfactory. At the end of the year the Company had gas heating and lighting appliances on hire totalling to 1839, as against 1654 in the previous year. The number of ordinary meters in use was 3504; and of slot-meters, 1973. A dividend at the rate of 3 per cent. on the Company's consolidated ordinary stock was recommended, which, with the interim dividend paid for the June half year, would make a dividend for the year of 5 per cent. The Chairman remarked that this statement was a very satisfactory one. Though 2¼ per cent. more gas had been sold, 600 tons less coal had been used. The mills had not consumed as much gas by 3 million cubic feet, which was due to the trade in the district not being as flourishing as in past years; but the domestic consumption had more than counterbalanced this loss. The Company had ten installations of high-pressure gas lighting in the district; and these were giving great satisfaction. This was undoubtedly the best possible means of illuminating factories, and one which was likely to develop greatly. The public lamps had all been converted to the incandescent system. A notable increase had taken place in the number of gas-boilers on hire; there being now over 400 in use. The public lamps had increased from 431 to 442. The largest output in one day had been 568,000 cubic feet. The report was adopted; and a vote of thanks was accorded to the Engineer (Mr. J. H. Brearley) and other officials. Following the meeting the Directors entertained the stockholders at dinner, in celebration of the jubilee of the Company. Alderman B. Broadbent, who proposed the toast of "The Chairman of the Company," remarked that, in addition to the Company's jubilee, they also celebrated the connection with the Company of Mr. Robert Thornton, the Chairman, who fifty years ago was Secretary. They were doing right in testifying their appreciation of what Mr. Thornton had done by making a presentation to him. The toast was enthusiastically received, with musical honours; and Alderman Broadbent then handed Mr. Thornton a beautiful silver salver, bearing the following inscription: "1859–1909. Presented to Robert Thornton, Esq., the Chairman of the Board of Directors, by the Directors and Stockholders of the Longwood Gas Company, on the occasion of the jubilee of the Company, Feb. 18, 1909, in recognition of long and valued services as Secretary at the formation of the Company, and as Director for twenty-seven years, including four years as Chairman." The Chairman responded to the toast, and returned thanks for the gift. Among the other toasts was that of "The Officials," which was responded to by Mr. Charles Hall (Messrs. Hall, Walker, and Norton, Solicitors to the Company) and Mr. Brearley.

A Good Position at Salisbury.

Presiding at the half-yearly meeting of the Salisbury Gas Company last Wednesday, Mr. George Fullford, the Chairman, stated that the usual dividends had been fully earned, and that the operations of the Company during the six months had been of a satisfactory character. They had not taken quite so much money for gas sold as in the corresponding period of the previous year; but this was amply accounted for by the reduction in price on Oct. 1, and by a lessened consumption during the bright and mild weather experienced in the early part of the winter. Residuals had sold fairly well; but the prices for tar had been lower. Their coal had cost rather more; but the business showed sound and satisfactory progress. Mains had been extended to new property; and the number of services laid on was equal to the average of past years. The works were well equipped with the most modern machinery; and the demand for slot meters and cookers was well maintained.

The Company had under their care the maintenance of a very large number of lamps, both outside and indoor—a work that had proved eminently satisfactory to the consumers and also to the Company. Looking at the accounts, it was very evident the Company did not exist for the benefit of the shareholders exclusively. The workmen employed numbered 75 to 80, exclusive of the clerical staff; and no less than £4750 was paid out annually in weekly wages, and would be spent in the city. During the current year, they had paid £698 16s.—that was, over one-sixth of their net income—for local, poor, and district rates, exclusive of King's taxes. They were supplying the consumers with 18-candle gas, of unexceptionable quality as to purity, at a low figure, considering the local cost of coal and other circumstances. Only with cheaper coal, or lower Imperial and local rating, would further reductions in price be possible. The Directors, in common with other gas companies in the kingdom, were co-operating to form what all believed would be a real benefit—a Professorship of Gas Engineering and Fuel at the Leeds University, in memory of that great pioneer of the gas industry, Sir George Livesey, whose death they all deplored. The report was adopted; and the Directors, Engineer (Mr. Norton H. Humphrys), and staff were thanked for their services.

Successful Working and Reduced Price at Scarborough.

There were two highly satisfactory features in the report presented to the shareholders of the Scarborough Gas Company at their recent meeting. In the first place, the sale of gas in the year ending the 31st of December was higher by nearly 4½ million cubic feet than it was the previous year; next, the Directors announced their intention to reduce the price to ordinary consumers by 2d. per 1000 cubic feet after the present quarter. The accounts accompanying the report showed a sum of £10,179 available for distribution; and the Directors recommended the payment of the usual dividends on the ordinary stocks at the rate of 5 per cent. per annum (less income-tax); an interim dividend of 2½ per cent. for the first half of the year having been paid. This would leave a balance of £3590 to be carried forward. The Directors stated that the works and plant, under the supervision of the Manager and Secretary (Mr. Alexander Allan), had been maintained in efficient working order and condition. The Chairman (Mr. B. Fowler, J.P.), in moving the adoption of the report, remarked that for some years it had been his pleasure to move the adoption of satisfactory reports; and he was happy to say that the present one was no exception to the rule. The sale of gas for the year 1908 was upwards of 314½ million cubic feet, compared with 310¼ million cubic feet for the previous year—an increase of fully 4¼ million cubic feet. The number of consumers increased during the year by 241, and now totalled 10,490. It was interesting to note that in 1890, in order to meet the requirements of the small consumers, a system of accounts payable monthly was inaugurated; and in 1893 the prepayment system was adopted. The number of consumers under these systems was now 5388—more than 50 per cent. of the total number; and for these two classes of consumers the consumption showed the satisfactory total of 66½ million cubic feet for the year. The balance on the profit and loss account was £10,179; and after the payment of the usual dividend, there would be a surplus of £3590 to be carried forward. In view of the satisfactory financial position of the Company, and with a desire to give the consumers every benefit possible, the Directors had decided to reduce the price of gas after the March quarter by 2d. per 1000 cubic feet to ordinary consumers within the borough. The gross price would then be 2s. 6d.; being a reduction of 6d. during the past five years. This would make the net price 2s. 3⅝d., which was an extremely low figure for a town situated like Scarborough. The price charged to the Corporation would also be reduced to 1s. 10½d. per 1000 cubic feet, which would rank as one of the lowest prices charged for public lighting in the kingdom. The cost per lamp to the Corporation would then be about 3s. lower than it was when the old flat-flame burners were in use, with the added advantage of obtaining approximately four to five times the quantity of light. The reduction in the price of gas meant a saving to the townspeople of £2400, and a corresponding loss of revenue to the Company. Mr. R. H. Butterworth seconded the motion. Mr. Moorhouse having spoken in congratulatory terms of what he characterized as the "splendid report" the Board presented, the motion was carried. The dividends recommended were declared, and the retiring Directors and Auditors re-elected; the honorarium of the former being unanimously increased by £100. A vote of thanks was accorded to the Chairman and Directors for their continued attention to the affairs of the Company. The Chairman, in reply, said without the assistance of the Manager and staff, the labours of the Directors would be vain. In Mr. Allan the Company had not only a Manager who knew gas management thoroughly, but one who combined with his technical knowledge business aptitude. All who were connected with the Company tried to do their duty; and he moved that the thanks of the meeting be given to the Manager and Secretary, officials, and staff, for their attention in the interests of the Company. The motion having been carried, Mr. Allan, in reply, said it was a great satisfaction to them to know, at the end of the year, that their work had merited the shareholders' approval.

Increase in Consumers at Wakefield.

At the 124th half-yearly meeting of the Wakefield Gas Company, on Monday last week, the Directors reported that the balance available for dividend was £9107. The accounts accompanying the report showed that the receipts from the sale of gas amounted to £15,544, and from the disposal of residuals to £5042; the total revenue being £22,405. The expenses of manufacture were £12,153, and of distribution £2229; the total expenditure being £17,695—leaving £4710 to be carried to the net revenue account. The Directors recommended the payment of dividends as follows: 5¾ per cent. on the £25 and £5 shares, 4½ per cent. on the "B 5ths" £5 shares, and 4¼ per cent. on the new ordinary shares—all less income-tax. The Chairman (Dr. W. A. Statter, J.P.), in moving the adoption of the report and accounts, said that, in common with most gas undertakings, the Company's earnings had been adversely affected by the depression in trade, the high price of coal, and the mild weather prevailing during the past half year. There had been a decrease of 0·86 per cent. in the consumption of gas, but the number of consumers had increased by 365; so that the Directors looked forward with confidence to the future when trade improved and coals returned to more normal prices. The report was unanimously adopted; and the payment of the usual dividends approved. Hearty votes of thanks were accorded to the Directors, the officers, and their staffs, and were suitably acknowledged.

Adverse Influences but Satisfactory Progress at Walker.

In the report presented at the annual meeting of the Walker and Wallsend Union Gas Company last Friday, the Directors announced that the effect of the strike on the North-East Coast, coupled with the general depression in trade, had led to a diminished output of gas in the past year. The number of consumers, however, continued to increase; the total on Dec. 31 being 11,513. The average cost per ton of the coal carbonized during the year exceeded that for 1907 by 5·35d., for 1906 by 2s. 7·42d., and for 1905 by 3s. 1·81d. The capital account had increased during the year by £43,103, mainly in respect of the new works at Howdon Lane, which since their inauguration had given every satisfaction, and had quite justified the results anticipated. Manufacture had been discontinued at the old works at Willington Quay; and during the coming spring the Walker works would follow, and the whole of the manufacture be then concentrated at the new ones. The scheme of co-partnership outlined at the last annual meeting was adopted, commencing on the 1st of July; and it met with the general approval of the employees. The accounts accompanying the report showed that the revenue for the year was £42,765, and the expenditure £30,571; leaving a balance of £12,194 as the profit. This added to £4554 brought forward, made a total of £16,748. Compared with 1907, there was a decrease of £1368 in the receipts and of £2073 in the expenditure; resulting in an increase of £705 in the gross profits. The Directors proposed, out of the £16,748, to credit the depreciation fund account with £500, and after paying interest on mortgages and the interim dividends at the rates of 5, 4½, and 6 per cent. per annum, less income-tax, to pay final dividends on the preference and ordinary stocks at the same rates. These payments would absorb £11,540, and leave £5208 to be carried forward. The Chairman (Alderman G. A. Allan), in moving the adoption of the report, said that, notwithstanding the adverse influences mentioned therein, he thought it would be agreed that it was very satisfactory. The profits were more than ample to meet all interest, the payment of maximum dividends authorized under the sliding-scale, leasehold depreciation, and to enable them to augment their balance of undivided profits to £5208. Hitherto for a great number of years a continuity in the increase of gas sales had been on record. The past year, however, owing to the strike and depression of trade, recorded a decrease of 9·49 per cent., more or less generally throughout the district. The increased price of gas counterbalanced the receipts for the sales of gas. Coal had cost more than previously; but, on the other hand, relatively better prices had been received for coke. The Directors hoped to obtain coals during the ensuing year under more favourable conditions. Other factors of revenue showed more or less good results; the transfer of manufacture to the new works affecting operations. Regarding the capital expenditure of £43,103 during the year, the main portion—viz., £36,323—was on account of the new works at Howdon Lane. This practically completed the payment for the whole arrangements as surveyed at the inauguration ceremony, and specified in the pamphlet subsequently sent to each shareholder. New and additional mains had cost £5472, principally in connection with a 24-inch main laid from the new works to the west of Wallsend, towards the completion of a circuit which would allow all the operations to be carried out at the new works. The development and progress of the Company during the past few years had been remarkable. Though capital expenditure had considerably increased, adequate profits had followed; so that it could, in a sense, be said that the additional capital had earned its own living. Mr. J. R. Lownds seconded the motion; and it was carried. The dividends recommended having been declared, and the retiring Directors and Auditor re-elected, a vote of thanks was accorded to the Chairman, Directors, and staff, and the proceedings closed.

Water.

A Question of Back Dividends.

Presiding at the meeting of the Colne Valley Water Company last Tuesday, the Chairman (Mr. C. E. Keyser) was in the happy position of being able to congratulate the shareholders on the best half year they had ever had during the existence of the concern. He also remarked that, although there were going to be changes with regard to the charges, due to clauses in their last Act of Parliament, the Directors still hoped to maintain the prosperity of the Company. The total of the water-rates for the half year was £23,172, compared with £21,243 in the corresponding half of 1907; so that the increase was £1929. The increase for the first six months of 1908 was £1679, so that the total increase for the year was £3609. This was more than it had ever been before; the highest previous increase having been just under £3000. With regard to new supplies, the total number added last half year was 474, which was rather fewer than the number in each of the previous four half years—the average for these having been 526. The estimated annual water-rental for the 474 is £1115 calculated on the new scale of charges, which came into force on Jan. 1. The average per supply was nearly 48s., as against the average of the last three years of 56s., calculated on the old scale. Mr. A. Helsham-Jones seconded the motion. Replying to an inquiry, the Chairman mentioned that the alteration of charges might make a difference of about £3500, but, increasing as the Company were, there was ground for hope that their prospects would not be seriously injured. The report and accounts were adopted. The full statutory dividends of 10 and 7 per cent. were declared—the Chairman remarking, in this connection, that they were carrying forward a larger balance than ever before; and if the Company were as well off in August as now, the question of back-dividends might be seriously considered. After the retiring Directors and Auditor had been re-elected, a resolution was passed converting the ordinary and the preference shares into stock. A second motion gave rise to considerable discussion. It was that: "Any surplus profits, as and when the same may be available, be applied, *with the consent of the Company*, as follows, to make up the deficiency of previous dividends which shall

have fallen short of the prescribed rate: In payment up to 16 per cent. on the three classes of ordinary stock equally, £37,100; in payment up to 30 per cent. in all on the remaining stock of the two remaining classes—viz., 'A' and 'B'—£21,000; in payment on the 'A' stock of the remaining amount of their outstanding back-dividends, £193,000 —total £251,000. The words in italics were not in the resolution as first submitted; but Mr. Alexander Dickson initiated a discussion which led to their insertion, though other phrases were suggested by him and other shareholders as more appropriate. Another resolution was passed, providing for the conversion of the unissued authorized shares into stock.

GAS, ELECTRICITY, AND WATER SUPPLY IN JERSEY.

Important Decision by the States.

In the "JOURNAL" for the 26th ult. (p. 254), we gave the text of a Bill which had been introduced into the Legislative Assembly of Jersey to place under public control the supply of gas, electricity, and water. The Bill came before the States last Thursday, when the preamble was passed, after discussion, the chief points in which are indicated below.

The subject was introduced by Deputy Renouf, who stated that when it came before the House on the 26th ult. some of the existing Companies petitioned to be heard. It was made clear at the time that their position was an anomalous one, as they were performing public duties without having any public rights. The discussion was put off to allow the Companies to be heard at the Bar of the House if necessary. He agreed with this course, but did not know what the Companies intended doing. If the Bill went back to the Committee, he thought the preamble should first be passed. He realized what the Companies had done in the way of supplying public needs; but he considered that they must be put on a sound footing, both for public and private interests. He proposed the adoption of the preamble of the Bill, which set forth that "it is in the public interest to place commercial undertakings for the supply of water, gas, and electricity under public control.

The motion having been seconded, the Deputy of St. Saviour, who is the Solicitor of the Gas Company, said he desired to propose an amendment, as it would be dangerous to pass the preamble of the Bill unless the States were prepared to legislate as far as had been done in England, where Private Bills affecting particular companies were often brought in and passed. He proposed that the Bill, together with the petitions lodged, be referred to the Committee which had been specially named; and, further, that representatives of the Companies be heard by this Committee. Deputy Pinel, seconding the amendment, remarked that legislation on the subject before the House should have been adopted years since; and he expressed the hope that the amendment would have the effect of putting matters on a proper footing. He thought, however, the Committee had exceeded their mission. They were asked to make an inquiry and report to the States. The best course now was to hear the Companies' representatives. This point had been ignored by the Committee, who had gone a little too far by preparing a project. He might mention that the petitioning Companies intended later to introduce Private Bills. He thought any such legislation should come from the Companies, as it was difficult to bring different concerns under the same General Bill.

The Mayor of St. Helier said they had been asked to have private legislation as in England. The facts were the other way about. There were main Acts passed in England which corresponded with the Bill before the States; and the companies brought in Provisional Orders which corresponded with the Licence which would be given by the Bill. He objected to the hands of the Committee being tied by the various Companies. Jurat Payn said he was not sure that the fundamental Acts passed in England corresponded with the Bill before the House, and that Provisional Orders were the same as the Licence to be accorded in Jersey. He thought, therefore, the best course would be to support the amendment. The Rector of Trinity contended that if they passed the preamble they would be admitting that hitherto the Companies had been outside the law. The preamble provided for the Companies being under public control; but surely this was only a question of degree. Let them give the Committee a free hand, and afford them an opportunity of preparing a new Bill if necessary. If they voted for the amendment, they would give the Committee greater powers.

Deputy Nicolle proposed, as a further amendment, that the States should pass the first paragraph of the preamble, and refer the Bill and the petitions to the Committee. The Mayor of St. Clement seconded this amendment. Jurat Benest said he favoured the whole question going back to the Committee. The States should not give the "cold shoulder" to any of the Companies who at present had certain rights. Jurat G. Le Gros remarked that if they adopted the amendment of the Deputy of St. Saviour, the Committee could either pass a general law, or could bring in a Bill for each Company, which would appear to be the better way. Passing a general law applying to all Companies was not a course to be favoured, for the requirements of each Company were so vastly different. They all agreed, however, that there must be some legislation. The Mayor of St. Helier supported Deputy Nicolle's amendment.

After some further remarks, the Deputy of St. Saviour, replying on his amendment, said he wished to state that in England some companies were perfectly free, and were under no legislation whatever. Under the local Bill, it was proposed that the authority of the Crown be set aside; but in England legislation on such subjects received the assent of the House of Commons. Why should the States tie their hands before they knew all the facts bearing on the subject? The amendment left the whole question open, and allowed the Committee to go on with their work as fast as they pleased. He submitted that everything in the amendment was perfectly fair and honest.

Deputy Renouf, replying on the main proposition, referred to the attitude of the Companies, who were informed they could appear at the Bar of the House and had not done so. He said that the Companies wished to dominate the position, and asserted that the amendment was presented as from them. The Deputy of St. Saviour (interposing) objected to this statement, and said the amendment was his own. Deputy Renouf (continuing) said he desired to discuss the question with the Companies, but had no desire to see the Committee dominated by them. They were claiming a legal status which they did not possess. The attitude towards them was one of public tolerance. They were not philanthropists; they had made money out of their schemes, and had at the same time supplied a public need. The speaker went on to refer to the legislation which had been obtained from the Board of Trade, and said it had been suggested that the States could not possibly draw up an adequate Bill short of a big-sized volume; and yet the Companies stated they would bring in a Private Bill. The position was too ingenious. Let them adopt the principle at stake, and then let the matter go back to the Committee. It was only fair play that this should be done.

A vote was then taken on the amendment proposed by Deputy Nicolle, and it was lost by 17 votes to 27; Deputy Renouf's proposition being carried by 31 votes to 11.

Deputy Renouf then moved that the Committee should take the petitions into consideration, hear the petitioners if they so desire, and report to the States whether for the reasons brought forward there is any necessity to modify the Bill. This having been seconded, the Deputy of St. Saviour moved that the rest of the Bill be referred to the Committee. His proposition was, however, lost by 13 votes to 23, and the motion carried, on a standing vote, by a large majority.

PRICE FOR POWER AND MANUFACTURING.

Simultaneously with the reduction in the price of gas to ordinary consumers to 1s. 11d. per 1000 cubic feet (making the charge the lowest in London), the Wandsworth and Putney Gas Company have notified power and industrial users of gas that a discount will be allowed them of 15 per cent., bringing the net cost to about 1s. 7½d. per 1000 cubic feet. The conditions are that a separate meter (or meters) must be employed for gas used for power and manufacturing purposes, or a check meter may be employed; and notice of any alteration in the consumer's pipes, connections, apparatus, or manner of using must be given to the Company. The Company's officers and workmen are to have access to the pipes, connections, apparatus, &c., of the consumer at all reasonable times. Should gas supplied through this separate meter be used for lighting or purposes other than for power or manufacture, the discount on the registered supply will not be allowed.

Accompanying the above notice is the following information:—

Gas v. Electricity.

	s.	d.	
Electric motor—Requires 8½ units per hour, at 1½d.	1	0¾	per hr.
Gas (10 H.P. engine) requires 200 c. ft. per hour, at (1/11, less 15 per cent.) 1/7·55 per 1000 c. ft. .		3·9	per hr.

The initial cost of a gas-engine is about the same as a motor of the same horse power.

Gas (Ordinary) v. Suction Gas

The power obtained by the use of suction gas is less than one-fifth that given by ordinary gas. Great danger to workmen and premises is incurred by the use of suction gas.

Electric Lighting.

Although the incandescent gas-mantle is far superior to this in light, to say nothing of the cost, yet if electric lighting is wanted, the cheapest light can be produced by a gas-engine and dynamo at about ½d. per unit. (The price of gas for gas-engines is 1/7·55 per 1000 cubic feet.)

Reduction in Price at Yeadon.—At the meeting of the Yeadon and Guiseley Gas Company, it was decided to reduce the price of gas 1d. per 1000 cubic feet, as from the 1st ult. This will make the charge 2s. 6d. per 1000 feet.

Walthamstow Gas Tragedy.—On Sunday night, Mr. and Mrs. Fysh, who lived in Jewel Road, Walthamstow, and were aged respectively 87 and 85, were found lying dead in their bedroom with the gas turned on full. Deceased had lived in the locality for several years, and were thought to be of independent means.

Shortage of Water in a Village.—A water famine is being experienced in parts of Cambridgeshire and Norfolk, consequent on the continued dry weather; and the Marshland Rural District Council have decided to petition the Local Government Board to send an Inspector to hold an inquiry. The villages of Saxon Street, Wratting, and Wood Ditton, in Cambridgeshire, are obtaining their supplies from a great distance.

Murder and Suicide by Gas.—Last Friday, Mr. Wynne E. Baxter held an inquest at Limehouse on the bodies of Rosetta Phelps, aged 36, and her daughters, Millicent, aged 10, and Elsie, aged ten months, who died from gas-poisoning at Blackwall Buildings, Whitechapel, on the previous Tuesday. The deceased woman was the wife of a carman. The evidence showed that she had not been depressed and had never threatened to take her life. Her husband left home in the morning, and a little later the two elder children went to school. Subsequently Mrs. Phelps went to a neighbour for change, saying she wanted some coppers for the gas-meter. When the two children returned, they failed to find their mother in the kitchen, and discovered that the bed-room door was locked. A neighbour was called, and on the room being entered it was found that it was full of gas, and that gas was coming from a jet from which the top had been taken. Four pennies had been put into the meter. On the floor lay Mrs. Phelps in a dying condition, and on the bed were the two children. All three were breathing feebly, and died in a few minutes. The cause of death was suffocation by gas; and the Jury found that the mother had committed murder and suicide while of unsound mind.

SUCCESSFUL APPLICATION OF TAR TO BRISTOL ROADS.

Report by Mr. Yabbicom, the City Engineer.

The following interesting report in favour of the use of tar for the prevention of dust on roads was laid before the Bristol Sanitary Committee last Thursday, by Mr. T. H. Yabbicom, M.Inst.C.E., the City Engineer.

In consequence of the measure of success attending the experiments tried in this city for the mitigation of the dust nuisance during the summer of 1907, it was decided to give in 1908 a more extended use to the materials that had already been employed with most success. The spring of 1907 had been so wet that the roads were not in a condition to receive the applications until the month of June, and even then were not sufficiently dry in many places for the tar to adhere properly. Notwithstanding these drawbacks, the treatment had been fairly successful, and quite sufficiently so to warrant a further and larger trial. In the early part of 1908, the climatic conditions were much more favourable for a start than in the previous year; and the opportunity was taken advantage of. The palliatives employed were the application of tar by one of three methods, or of a chemical in solution.

The total length of macadam roads to which tar was applied was 50½ miles. The application was made in one of three ways:

(1) By means of a heavy traction machine supplied by the Taroads Syndicate; the machine travelling at the rate of about 2 miles per hour, and the tar being sprayed over the surface of the road through nozzles under pressure. As the roads so treated were about 8 or 9 yards wide, the machine was able to cover the whole width of the road in two journeys. About 41¼ miles were so covered, nearly 20 miles being in No. 2 district and 12 miles in No. 3 district (these two having essentially suburban traffic); while 7 miles in the city district were so sprayed, the balance being done in the Bedminster area. Immediately before the tar was sprayed over the road, the surface was carefully brushed clean, and freed from all droppings and fine dust. Directly the tar had been distributed, a thin coating of fine, sharp, Bideford sand was scattered over the whole. This enabled the newly-treated surface to be used almost immediately, and obviated the trouble and expense incurred during the previous year in placing and maintaining barricades for the prevention of traffic until the tar had dried. The whole expense of the first cleaning, the tar spraying, and the sanding averaged 0·95d. per yard superficial.

(2) By means of a portable hand-spraying machine. This was tried only on the Avonmouth district (No. 6). The machine is of a very simple character, being only a tank to contain 12 gallons of hot tar, fitted with a force-pump, a hose-pipe, and jets for distribution. It is easily worked by two men; but it has the disadvantage of having to be taken to the depôt frequently for refilling or accompanied on the road by an ordinary tar-boiler. The latter plan is found the most useful. This little machine sprayed over 1½ miles of the roads of light traffic very successfully; but the force of the tar through the delivery-holes is scarcely sufficient to cause as much penetration of the surface of the macadam as is necessary where there is much wear and tear. The cost worked out at 0·58d. per superficial yard.

(3) Tar painting by hand labour was again resorted to on 7¾ miles of road; the greatest length being in the St. George district (No. 4), where over 5 miles were so treated, the remainder being in Nos. 1 and 5 districts. Considerably more tar is used in this process. The results are not so even; and the time occupied to cover a piece of road is considerable. The cost averaged 1·41d. per superficial yard.

The costs named above mean the total cost of the tar treatment, by whichever process, over the whole season.

As to treatment by chemicals in solution. The compounds employed were calcium chloride, alkonia, and habnite; the object in each case being to maintain a damp surface by the use of a deliquescent salt. About 18 miles were treated with the first-named salt, about 2½ miles with akonia, and a small experiment made with the last-named. There did not seem to be much difference in the effect produced; and as the calcium chloride was the cheapest, it was the most used. The beneficial results of an application of salts disappeared after intervals of four to six weeks, according to the state of the weather, and had to be renewed. A certain amount of watering was also necessary to keep the surface moist. The costs varied, therefore, from ¾d. to ⅞d. per superficial yard for the season.

On the question of the prevention of dust, the reports from all the district surveyors are unanimous in giving a decided preference to the treatment by tar, though the effect of the chemicals was valuable in steep places, such as Park Street, where it would not have been safe to have applied tar. The dust nuisance was reduced to a minimum during the whole season by one application of tar. At the same time, it was not possible to do away with the water-cart altogether on the treated roads, for dust accumulates on the surface, and in the channels, from a variety of sources other than the disintegration of the macadam by traffic, and has to be dealt with. One advantage of such a surface as is produced by the thin layer of tar is to enable the dust that does accumulate to be easily removed, or its tendency to blow about minimized, by a very slight sprinkling of water in the early morning. This is a very different thing to the clouds of pulverized granite or limestone raised by rapid traffic from the destruction of the road metal where tar was not employed. Where the roads were tarred, the scrapers, both the horse-drawn and the hand-propelled, were no longer used; but a little careful attention during the day by a few men with hand-carts kept the roads in a far cleaner state than when load after load of slop had to be removed.

One season differs so much from another, that it is almost impossible to make a comparison in figures of the amount of watering saved by the treatment. But one fact is significant. In the Clifton district, which is essentially one of macadam roads, and where nearly one-half of the total mileage of treatment was carried out, the average number of water-carts in use daily during the summer of 1906, before any treatment was tried, was 25, and the quantity of water distributed 13,349,000 gallons—1906 having been a dry summer. The summer of 1907 was wet, or showery, and therefore not useful for the purposes of comparison; but the summer of 1908 was again dry. The effect of the treatment was that only a daily average of 15 water-carts were required on all classes of roads in Clifton district; and the consumption of water fell to 7,962,000 gallons. Thus, in this one district alone, the cost of water and distribution was reduced by £862.

Another effect was that, as a quantity of the watering plant was set free by the employment of dust-preventing materials on certain roads, these carts were available for watering others that would not otherwise have had so much attention.

The cleansing of the roads treated with tar was effected in a much more satisfactory and thorough manner than was possible in other cases. Though it was not, apparently, possible to make much reduction in the amount of manual labour employed, that labour was directed to a more intelligent and useful form of cleansing than by scraping up tons and tons of the road surface and carting it to the tip. Under ordinary circumstances, the use of a rotary brush, or a horse scraper on a macadam road is to deprive the road of its best surface material, and even hand brushing and scraping cannot be adopted without raising and removing the particles of grit. Where the tar has been distributed, this vigorous brushing and scraping are no longer required; a little light brushing to remove the dust blown on to the road and horse-droppings being all that is necessary. It is not, however, in dry weather only that the advantage of the treatment has been felt; for, as the Surveyor of No. 3 district remarks, "during wet weather no mud has worked up, the roadways being almost as passable as the footways." This has been the experience everywhere.

Of course, no saving could be expected on cleansing where chemicals were employed, the very means by which the dust is prevented being the continued dampness of the surface.

The actual saving in repairs to the roads due to the use of tar is very difficult to be represented in money on any particular year, as there are such a variety of circumstances influencing the question. On this point, the district surveyors, who have the best means of arriving at an opinion on the subject, are properly cautious in making definite statements. Yet all concur in the opinion that with a continuation of the treatment "considerable economy will show itself," to quote the words of the Surveyor of No. 1 district. One fact may be noted—namely, that the quantity of hard stones, granites, &c., sent from Redcliff Wharf amounted in 1906 to 9127 tons, and in 1907 to 9417 tons, while in nine months of 1908 only 4000 tons were weighed out—giving an average for the year of 5333 tons.

The Surveyor of No. 2 district states in his report that the repairs in 1908 to roads that were in first-class condition before tarring have been practically confined to small patching repairs with tarred macadam. The effect has been to allow some of the untarred roads to be brought up to a state of greater efficiency, such as would be necessary if the treatment is to be extended to them on a future occasion. In No. 3 district, the report states that "no repairs have been necessary to any tar-sprayed road except where trenches have been opened;" and the Surveyor gives a guarded opinion that, extended over a period of years, the saving in repairs may amount to £23 per mile. The Surveyor of No. 4 district estimates the saving in repairs at 25 per cent.

It has been abundantly proved that tar, wherever it has been put, and in whichever manner it has been employed, has effectually attained the object of dust prevention; also that the chemical treatment produced the desired end, though in a less degree. That the treatment has not been unduly expensive is shown by the total cost of all the processes having amounted to £3468 on 71 miles of roads. When the roads were watered by contract, the schedule price for the distribution of water on this length would have been £4118, not including the cost of the water. The cost has not been charged to a separate account, but divided over the items of watering, cleansing, and repairs, without adding to the charges for these services. The cleansing has been done in a more thorough and systematic manner on the roads treated with tar than is possible on the others. The necessary repairs have been much less frequent, and may reasonably be expected to show a valuable reduction on an extended term of years.

For the above reasons, and from the experience of the last two years, your Engineer recommends a continued and extended use of tar treatment wherever the gradients of the roads will allow this to be done, and that calcium chloride be employed as an alternative. The date for commencing will depend entirely on the weather; but given a fairly dry spring, your Engineer recommends beginning as early as possible, as a proportion of the advantage is lost if the application is not made until the summer is well advanced.

A DISASTROUS AIR-GAS EXPLOSION.

We learn from the issue of "Carbid und Acetylen" of the 15th inst., that a disastrous explosion occurred at the air-gas works established at Telgate, in Westphalia, for the supply of the town with gas. It appears that the works were erected seven years ago by the Aerogen Gas Company of Hanover, who obtained a concession for the sole public supply of light to the town for a period of thirty years. The air gas is used for the public lighting of the streets, and is supplied to a large number of private consumers.

About two o'clock in the morning of the 2nd inst., there was a violent explosion at the air-gas works, which completely wrecked them. The noise of the explosion was heard to a distance of some four to six miles, and the violence on the spot was such that a roof and thick timbers on the works were carried to a distance of over 200 yards. The surrounding houses were so severely shaken that the occupants fled precipitately to the street, under the impression that an earthquake had occurred. The tiles were stripped from the roof of the nearest house, and the doors were blown from the hinges. Windows were broken over a much wider area. Much of the *débris* from the works was thrown on to the adjoining railway lines, with the result that the early morning train from Münster was delayed until the line could be cleared. The telephone and telegraph wires were also injured, but were repaired by mid-day. According to one account, the explosion was not followed by fire; but according to another, there was a fire on the works, which, happily, did not reach the benzoline store. Accounts agree, however, that the services of the Fire Brigade were not called

into requisition, though one report states that this was because of the fear of further explosions on the works. It seems that a second disaster was averted by the prompt action of the Works' Manager, who was on the spot shortly after the explosion and turned off the main supply tap. The gasholder was split and badly tilted, and the benzoline motor was thrown from its foundation. Scarcely a bit of brickwork was left intact on the works. Marvellous to relate, no injury to life or limb occurred. The cause of the explosion has not yet been satisfactorily made out, though one report mentions that a strong escape of the gas had been noticed for fourteen days before, and it may be that the escaping gas ignited at a benzoline flame which was in use to prevent the freezing of the pipes.

The destruction of the works, on which the town relied for light, and to a large extent for power, has left the inhabitants in very awkward straits. The street-lanterns are not readily adaptable for oil-lamps, and the oil-lanterns which were in use prior to the introduction of air gas have been disposed of. At present temporary lamps are used in the evening in the more frequented streets, and the business houses are closing at dusk. It seems that the Aerogen Gas Company started on the 4th inst. to rebuild the works; but in the course of the afternoon the work was stopped by a State Order made at the instance of the railway authorities and the neighbouring inhabitants. A public inquiry is to be held with a view to deciding whether the works may be erected again on the same or any other site. The Local Authority desire, in view of the explosion, to obtain a supply of coal gas or electricity; but the thirty years' concession granted to the Aerogen Gas Company appears at present to be an insuperable obstacle to such a change. Moreover, it is reported that the pipes forming the distributing system are of too small diameter to serve for a coal-gas supply, having regard to the fact that coal gas would be much more freely used for heating and motor purposes. It seems that they barely sufficed for the supply of air gas. Our contemporary draws attention to this point because, it states, the Aerogen Gas Company have constantly contended in favour of air-gas installations for small townships that the gasholder, distributing system, and fittings would serve for a subsequent supply of coal gas, should an increase in consumption at any time call for a change from air gas to coal gas.

STOPPAGE OF WORK AT THE MILAN GAS-WORKS.

What can hardly be called a strike, but was a short and sharp cessation of work by all classes of those employed by the Union des Gaz Company in their undertaking at Milan, suddenly took place last Tuesday. From the local newspapers, we learn that at about 5 o'clock in the evening all the workmen at the San Celso, Porta Nuova, and New Bovisa Gas-Works, as well as the clerks at the Company's new offices in Via Bassano Porrone, gave up work.

The origin of the trouble seems to have been that the recently appointed General Manager (Signor Giuseppe Grüss), who has succeeded Signor F. Lacombe, nominated one Signor Arcangeli to the post of Secretary to the Manager at the San Celso works. This employee has only been in the Company's service some six years; and his appointment was regarded by the staff as a breach of one of the terms of the agreement between the late General Manager and the men, that "where there was equal merit, regard should be had to seniority." In addition to this, the appointment in question was regarded as provocative, seeing that Signor Arcangeli was not a member either of the Federation or of the Gas-Workers' Union. Two representatives of the workers at once waited upon the Manager to inform him of the agitation that had been aroused; but Signor Grüss did not accept their views, and is reported to have said that if the men and employees wanted to strike, they could do so. Such a reply exasperated the men; and work was stopped pending further developments. A second conference proved equally futile, though Mr. Hovey (who it will be remembered recently went out to Milan as Chief Engineer) and the Manager at San Celso said it would be better not to provoke a strike on a mere point of precedence.

The workmen's representatives then explained the seriousness of the situation to outside officials—Comm. Bondi and Cav. Pignatari—pointing out that the dispute was not concerned with the merits of Signor Arcangeli, but was wholly a defence of a right. Comm. Bondi summoned Signor Grüss, and showed him what his responsibility would be if a strike ensued. The Manager being still in an unyielding spirit, a conference of officials was called at the Palazzo Marino, at which the Syndic and others were present. Eventually, after a long discussion, Signor Grüss agreed to suspend the appointment of Signor Arcangeli, and to submit the matter to arbitrators. This being done, work was immediately resumed; and so what might have been a disastrous strike was averted.

Nelson and the Lomeshaye Gas-Works.—At Nelson, last Wednesday, a Local Government Board inquiry was held regarding an application by the Corporation for sanction to borrow £2750 for the purchase of the Lomeshaye Gas-Works from Messrs. Ecroyd. The purchase will, it is stated, give the Corporation the right to supply gas to the Lomeshaye district of Nelson now vested in Messrs. Ecroyd.

Electric Light Failure in the Camborne Council.—The Camborne Urban District Council are being well versed in the inconveniences of electricity. For the second time within a few weeks, the members were at their last meeting left in darkness by the sudden failure of the electric light. On this occasion, however, the officials were somewhat prepared; for they were able to produce what remained of a packet of wax candles which had been called into requisition at the time of the previous failure. These were lighted and handed round to the members. But the novelty of the proceeding has now worn off; and we are glad to note that the Camborne councillors have learnt their lesson. Directly the last failure occurred, without waiting for lights, a member proposed that the Council Chamber be provided with gas-fittings. Three or four other members hastened to second the motion, which was carried without any delay; and by this simple expedient a recurrence of the annoyance of having to transact business in darkness has been effectually guarded against.

COATBRIDGE GAS PROVISIONAL ORDER.

Last Thursday the Hon. T. H. W. Pelham, C.B., had before him, at the Offices of the Board of Trade, a Provisional Order promoted by the Coatbridge Gas Company, in which authority was sought to reduce the illuminating power of the gas at present supplied from 20 to 15 candle power, and to adopt another method of testing the quality and the illuminating power than that at present in use.

Mr. Joseph Shaw (instructed by Mr. John M'Lachlan, of Glasgow) appeared for the promoters; and Mr. R. J. Neville (instructed by the Town Clerk of Coatbridge) represented the opponents, the Town Council of Coatbridge.

Mr. Shaw, in opening, said that the Company was incorporated in 1877, with a capital of £44,650 and borrowing powers of about £10,000. There were the usual powers of paying 10 per cent. dividend on the original capital and 7 per cent. on the new capital. The maximum price was 6s. per 1000 cubic feet. In 1898, when the Company came for further capital, a sliding-scale was introduced with a standard of 2s. 6d. and a zone up to 2s. 11d. The average price of gas for the last ten years had been 2s. 4·21d. The dividend on the original stock had been on an average £10 12s. 6d. per cent., and on the 7 per cent. stock £7 8s. 9d. The object of the Order was to reduce the illuminating power of the gas from 20 to 15 candles; the burner to be used for testing being the "Metropolitan" argand No. 2. The Company had been paying maximum dividends all along because their consumers had been getting gas at the lowest price in the whole of Scotland.

Mr. *Corbet Woodall* was then called. He said that when companies came to Parliament it was the universal practice to ask for a reduction of candle power, because the incandescent mantle had entirely altered the conditions. He denied that the argand No. 2 would give an advantage of 4½ candles—it was about 2 candles. With regard to the suggestion of the Town Council that incandescent mantles were not adaptable for use in factories, he could point to factories of all kinds where they were employed; and there was no reason why they should not be universally adopted.

Cross-examined by Mr. Neville, witness admitted that where a light was required to be moved about, more care was necessary in the case of incandescent mantles. He was interested in engineering works, and also in a pottery, where every man must have his own light, and incandescent burners were used most successfully. The coal used in gas manufacture must be very bad if it was only making 8000 cubic feet of gas a ton; but he would not say that the Company were not getting the full value out of their coal. The Manager told him that they were doing so. He put the saving due to the reduced quantity of benzol which would be required as 2d. per 1000 cubic feet for the 5 candles, and added another ½d. for the advantage due to the alteration of the standard burner. With regard to the working men, the saving in gas would far more than cover the cost of the mantles, even if there were carelessness.

Mr. *Thomas Wilson*, the Manager of the Company, said that from 8000 to 8500 cubic feet were produced per ton of coal. With 14-candle power by the old open bar test, there would not be any alteration in quantity owing to the reduction in illuminating power. He admitted that the Company had put more to the reserve fund and less to depreciation than they ought to have done. The reserve fund was to meet any extraordinary expenditure which might come in one year.

In cross-examination by Mr. Neville, witness said the Company had paid the standard dividend in every year except in one half year in 1906. The Company thought they were entitled to put money to the reserve. The use of incandescent mantles increased day by day.

Mr. *Andrew Lamberton* was then called on behalf of the Town Council. He said he employed about 400 men in an engineering works in Coatbridge. He objected to the Order because the consumers in Coatbridge had contracts with the Gas Company which had been eminently satisfactory to both parties. The incandescent lights as a general illuminant were perfectly satisfactory; but in cases where it was necessary to move a light, they were impracticable.

Mr. *Robert Tatlock* said that 15-candle gas tested by the "Metropolitan" burner No. 2 would be reduced to at least 11·5 candles.

Mr. *E. H. Stevenson* said that the difference in photometric value of the gas under the present system of testing and that proposed by the Order was, gas for gas, roughly one-half. A working man could not afford to invest in incandescent burners, although he could have the burners or mantles repaired if he got the burner. He considered that the Company could very easily save 4½d. per 1000 cubic feet of gas sold if the Order were passed. He did not like a zone; and Parliament did not like it either. In the present case, the zone did not give sufficient to the consumer. Parliament recognized that where there was a saving by legislating and not by the good management of the Company, that saving should go to the consumer and not any part of it to the shareholder. There were two cases where there had been a reduction in candle power, and also the more modern conditions of testing—namely, Basingstoke and Falmouth. They reduced from 15 to 14 candles, and obtained the "Metropolitan" No. 2 burner. The standard price of 4s. 4d. in each case was brought down to 4s.

In cross-examination, witness said he did not know of a case where the standard price was so low as 2s. 6d. where anything was taken off. There had only been one case where a Company (Plymouth) came to Parliament asking for a similar thing; but there the reduction was only 1-candle power. As to the Coatbridge Company getting the full quantity from the coal, it was possible to get very much more gas by having a greater heat. One might get all the volatile hydrocarbons out; but there was a lot of other gas which went off afterwards, which would increase the quantity, but would reduce the illuminating power—there was a certain amount of carbon monoxide.

Mr. *John Lavell*, the Convener of the Lighting Committee of the Town Council, said that incandescent burners were only used alone in 938 houses out of 8335. There were 20,354 ordinary burners used to 8000 incandescents. Ordinary burners were only used in 2855 inhabited houses. In 1119 houses, there were no gas-burners at all. The make of gas by the Company had been increased from 45,498,000 feet in the second half of 1897, to 88,000,000 feet last half year; and the capital

had been increased from £44,000 in 1897 to £75,000. The population in 1897 was 33,506, and in 1908 44,472. The valuation had increased from £153,713 to £217,000. There was in Coatbridge a decided feeling against lowering the power of the gas. An overwhelming majority of the inhabitants belonged to the working classes; and the effect of the Order would be to make them change their fittings. They were not very well able to afford the change.

In cross-examination, witness said Coatbridge might be peculiar in respect to its fittings. The houses were fitted with a double-socket bracket, which was movable, but which would not be adapted to incandescent burners.

Mr. NEVILLE, in summing up for the Town Council, said they wanted no change. They had an excellent light at an excellent price. They had no fault to find with the Company after their brilliant record. But if it was right that there should be the proposed change in the two conditions, he pointed out that it was a much larger change in the illuminating power than in any instance which had been given in the case of a company. Edinburgh was a case of the right hand paying the left; and it made no difference what the standard price was.

The CHAIRMAN remarked that if the inhabitants were content there with an illuminating power of 14 candles, why should not Coatbridge be equally content?

Mr. NEVILLE said that Edinburgh was not a manufacturing area like Coatbridge, and was not on all-fours with the present case. If the change were made, there would be a reduction of something near 50 per cent. in the illuminating power; and the only benefit suggested was that which would arise from a reduction in the price of gas, if one were made. If the price of coal rose and the price of residuals fell, there might be no such reduction; and if that were so, who would be benefited?

The CHAIRMAN said it would perhaps prevent the price going up.

Mr. NEVILLE said it might possibly do that; but it was no benefit to the consumer to have a worse gas if he had to pay a higher price for it. The conditions of manufacture would be much more advantageous to the Company, because there would be no enrichment, and there would be a corresponding saving in other matters; but there was no corresponding advantage to the Corporation. If the Order were given, Parliament ought to revise the bargain which laid down the standard price and the standard dividend.

Mr. SHAW said it was very serious to reduce a standard which was fixed extraordinarily low, simply because the Company had been able to make gas at the price, because it would be limiting their power of raising the dividend for ever. Notwithstanding that residuals might go to nothing, and the price of coal might go up to an enormous extent, he did not admit that the gas would be any worse. A lot of the present 20-candle power gas was waste. Consequently a good deal of the 2½d. which Mr. Woodall said would be knocked off was useless now. The consumers would get the benefit if they were enabled to reduce the price. The Order was wanted for the purpose of bringing the business up to date. The witnesses for the Town Council had given the Company a clean sheet, and had stated that they had given satisfaction by the way they had treated their consumers in the past. Under these circumstances, he thought they should have a little more confidence that the Company would exercise any powers given them to the advantage not only of the shareholders but of the consumers.

The Board's decision will be announced in due course.

Bradford Corporation Gas Undertaking.

A few days ago, Mr. H. Geldard, the Chairman of the Bradford Corporation Gas Committee, gave, at the Allerton Liberal Club, an address on the working of the undertaking of which he has charge. He traced the various efforts made to illuminate the city from 1803; and after concluding his historical sketch referred to the recent gas *v.* electricity controversy, and said that he could not sit still and allow the Gas Department to go down. He attributed the decrease in consumption last year to bad trade and the competition of electricity. A Sub-Committee were now sitting, considering the advisability of canvassing for consumers—a policy which was adopted by the Electricity Department. The Gas Committee were working hard and doing the best they could; but he confessed that the prospects looked bad. When he was elected Chairman of the Committee, there was every prospect of a loss; but that year's working actually showed a profit, and he hoped things would work out similarly this year. To a great extent, they were saddled with the gas-works in the out-districts. They had not made a cubic foot of gas at Eccleshill for two years; while at Idle they only worked six months in the year, at Low Moor eight months, and at Clayton five months. Though these works were perhaps necessary to them, the high prices which had to be paid made them white elephants. The sinking fund and interest alone cost £38,000 a year. The fight between gas and electricity was going on all over England; and to the best of his belief, given equal facilities, gas came out on top. Electricity, he thought—though he did not profess to be an authority—would never be as cheap as gas. Mr. David Wade, in proposing a vote of thanks to Mr. Geldard, predicted that there would be no profit on gas at Bradford this year.

Committal for Stealing from a Meter.—At the Old Street Police Court on the 13th inst., before Mr. Biron, Henry Pearl, an elderly man, was charged with breaking open a prepayment gas-meter belonging to the Commercial Gas Company, at 27, Virginia Road, Bethnal Green, and stealing 5s. therefrom. Prisoner's wife, from whom he was separated, occupied the house, and he forced the door and committed the robbery in her absence. Two days afterwards he gave himself up to the police. When charged, he pleaded hunger, and said his wife had a good home, whereas he had none. His Worship said the officer stated that the wife worked hard and the prisoner would not. At all events, he had no right to invade her place, and certainly none to break open the Gas Company's meter. As there had been several previous convictions, the accused was committed to prison for three months, with hard labour.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Valuation questions have bulked largely in Scotland this week; two appeals against valuations of gas-works by the local Courts having been heard in the Supreme Court. The first and greater one was that relating to the valuation of the Edinburgh and Leith gas undertaking. Than this case, no better illustration need be sought for of the necessity for legislative action in the matter of valuation. The whole subject has so developed that it has now almost entirely passed out of the controlling influence of statutory requirement into the region of judge-made law. The Edinburgh case is still *sub judice*, and therefore not open to comment; but notice may be taken of the fact that the subject is in such chaos that it was possible, in the discussion of the case, to quote numerous instances, on both sides, upon such elementary questions as whether landlords' profits should be taken into account in fixing the valuation, and whether the *solum* of the ground in which pipes are laid under statutory authority does or does not belong to the owners of the pipes. Such questions surely could be determined by direct enactment. The raising of them is due to the vigilance of assessors, who are not slow to avail themselves of the opinions of judges in cases which are sometimes very remote from the one under consideration, and to apply them to situations which are, to say the least, very frequently somewhat puzzling; and that, too, not only to the parties interested, but to the judges who are required to unravel the riddle. The first point in the Edinburgh case was thus brought up on account of the decision, two years ago, of a question relating to the valuation of the Leith Harbour and Docks. In the discussion this week, Lord Low was confronted with his remarks in the Leith case; and though he did not accept the interpretation which was put upon his observations, but pointed out how careful he had been, his task now is to find out how far, if at all, his disposal of that case is of general application, or, at least, of wider application, probably, than he meant on that occasion. In the second ground of appeal, the Commissioners are in the unusual position of asking the Court to add to the valuation of their undertaking. It is difficult to understand how this could be of general benefit to gas undertakings, because, if the Commissioners succeed in their crave, ownership of the ground in which their pipes are laid will not confer on them more powers than they already possess. There may be some anticipated advantage, which has not been mentioned, and which, as yet, is not apparent; but, of course, there are so many allowances and deductions in the process of making up a valuation, that the effect of this movement may turn out to be, not an addition to, but a reduction of, the assessable value of an undertaking. Certain it is that if the Commissioners succeed, the item will be added to the valuation of all statutory underground works, because the rule will be of general application. In this particular instance, the question has been raised by the Assessor for Leith, finding that he has no longer a gas-works within his area, placing a valuation upon the *solum* of the pipes, by which means he has added £2000 to the valuation of the burgh. The Gas Commissioners at first opposed the step, but, on second thoughts, acquiesced in it; and they are now endeavouring to get the Assessor for Edinburgh to take the same step, which would have the effect of reducing the proportion of the total valuation allocated to Leith. That the Assessor for Edinburgh and the Corporation supporting him do not see the matter in the same light, may be taken as indicating that there is more in the policy of the Gas Commissioners than appears on the surface.

The appeal from Bellshill was a novel and a bold one. The Company had, no doubt in view of the rapidly developing nature of their district, expended a great deal more money upon their works than was actually necessary; and they asked the Court not to tax them upon these redundant works until they were brought into use. This was, in essence, their position. They failed; the Court holding the view that the Company cannot both eat their cake and have it too. The decision of the Court is final. But it is a decision, and is open to criticism. The criticism I offer upon it is derived from the case which immediately succeeded that of the Bellshill Gas Company. In that appeal, the Company who supply electricity in Brechin sought to have their valuation reduced. They had expended £32,473 upon their works, which are now seven years old. In their struggling days, the Assessor had compassionately entered the annual value of the works at £200; but this year, feeling that a Company with such a large amount of capital expenditure—and which must now be held, in view of its revenue earnings, to be fully developed—should be assessed on the revenue principle, he raised the valuation to £660. The revenue for the year ending Dec. 31, 1907, was £1995; and the expenditure (which included outlays for repairs and renewals) was £1470. This left a balance of profit of £525; and the Assessor, doubtless taking into account the items for repairs and renewals, fixed the valuation at £660. The Company appealed to the Magistrates of Brechin, who reduced the valuation to £400. The Company appealed to the Supreme Court against the £400, and asked that the valuation of £200 be restored. The Court allowed the appeal, and reduced the valuation to £200. Stated in the abstract, the result of the two decisions is that a gas company who have incurred more capital expenditure than they required to must bear the consequence of taxation upon their super outlay; but an electric lighting company, in the same position, must be tenderly dealt with, and not taxed until they can show that they are earning the return they expected from their outlay. The decision of the Court was based upon sufficient information not having been adduced. But they had before them a net profit of £525, and the question of outlay upon repairs and renewals, which should have been sufficient information as to the standing of the Company. There can be no doubt that, technically, the decision of the Court in both cases was right; but, in view of the result, it may be stated, without hesitation, that law made by judges, whose function is circumscribed by the presentation of cases to them, is most unsatisfactory, and that there is clamant need for revisal of the Acts of Parliament relating to valuation.

Particulars are given in the Dunfermline newspapers to-day of the installation of a Keith high-pressure system of gas lighting into the

Canmore Works of Messrs. J. & T. Alexander, of Dunfermline. A compressor to operate upon the town gas has been put on. The installation consists of 300 Keith inverted lamps, each of 120-candle power, and consuming only 2 cubic feet of gas per hour. One of these burners efficiently lights two power looms, and, consequently, a very large number of flat-flame burners has been displaced. It is stated that the testimony of the workers is that the light is pleasant to work by. The James Keith and Blackman Company, Limited, of London, fitted up the installation. Several years ago, the Company fitted up part of the works of Messrs. J. Matthewson and Son, in Dunfermline, with their light; and this firm have been so pleased with the result that they have since arranged to extend the installation to the whole of their spacious works.

The Falkirk Town Council this year contains a proportion of members who are possessed of the idea that before their advent the affairs of the burgh were generally in a state of muddle, and that it is their mission to set things right. The gas undertaking is one of the departments which are looked upon as being in need of special attention; and, unfortunately, they have been provided with a handle to hold on by, in the shape of a deficit which was experienced in the gas accounts last year. This deficit, it may be explained, was mainly due to the Corporation having, when the price of coal rose, chosen to cope with it by the addition of only 1d. to the price of gas; but, of course, that is an explanation which reflects on the Corporation, and not on the officials, and therefore does not appeal to the common councillor. On Monday of this week, it was reported to the Council that, at a meeting of a Sub-Committee who had been appointed to inquire into and report as to whether there could be a more economical method of conducting the gas-works, the Manager had submitted comparative statements as to the staffs in the years 1908 and 1909, and that, after careful consideration of the whole organization at the gas-works, and after several consultations with the Manager, they approved of the general statements submitted by him with regard to the more economical and efficient method of working, and recommended acceptance of their report. As to the deficit, the Sub-Committee reported that it arose from various causes; but they believed that, from what had been arranged, such a recurrence would be obviated. All items, it was added, not dealt with by the Sub-Committee were left for the Gas-Works Committee; and the Sub-Committee asked to be discharged. Following the submission of this report, one of the councillors expressed surprise at the collapse of the investigation. Dean of Guild Neilson criticized the management in a not very friendly tone, insisting that the deficit amounted to £3496, instead of £2786, as stated by the Convener. The Gas Manager, Mr. Neilson said, told them that the deficit was chiefly caused by leaking retorts; but he thought it had been pretty well proved that leaking retorts were not the cause of the loss. There was a loss of £1492 upon the estimated sale of gas, of £754 on the estimated price of coal, of £431 on other material, of £442 on plant, of £368 on benzol, of £188 on water, of £85 on renewal and repair of meters and stoves, of £178 on tar and liquor, and of £412 on the sum estimated to be received from private parties for work and material. Bailie Bogle, the Convener of the Gas Committee, said he could not accept any of Mr. Neilson's statements, because Treasurer Wilkie stated that the deficit was £2700. There was no doubt that the retort-bench had sunk, and the cracked condition of the retorts had occasioned loss. The discussion then drifted into the question of the staff at the gas-works, in the course of which one member stated that there were 27 men in the works whose services could be dispensed with. In the end the report of the Sub-Committee was adopted.

In the Hamilton Town Council last week, the Gas Committee recommended that power be sought, in a contemplated Provisional Order, for the reduction of the illuminating power of the gas supplied from 16 to 14 candles, as tested by a No. 2 "Metropolitan" argand burner. The recommendation was adopted by nine votes to two.

A mysterious and extensive case of gas poisoning occurred in the Gorbals district of Glasgow early on Wednesday morning. More than a dozen people were affected, some of whom were taken to the Royal Infirmary for treatment. As many as 18 families were turned out of their houses for a time. At first the gas was thought to be sewer gas; but the surmise now is that it has been benzol vapour, or something of that nature, which has escaped from some underground premises in the neighbourhood. The source has not yet been discovered; and in the search for it more than one of the officials in the Sanitary Department of the Corporation have been overcome. There is no suspicion of the incident being due to escaping coal gas.

London County Council and Sulphur in Gas.—At the meeting of the London County Council last Tuesday, the report presented by the Public Control Committee on the subject of sulphur in coal gas in the Metropolis, given in the "JOURNAL" last week (p. 483), was adopted without discussion.

Mitcham and Wimbledon Gas Company.—At the half-yearly general meeting of this Company to-day, the Directors will present accounts which show, as the result of the working in the six months ending Dec. 31, a sum of £15,793 available for distribution; and they will recommend the payment of a dividend at the standard rate of 5 per cent. per annum, less income-tax. There was a satisfactory increase in the sales of gas, compared with the corresponding period of 1907; and, in view of the results of the whole year's working, the Directors have reduced the price by 2d. per 1000 cubic feet as from the last Christmas quarter.

Robberies from Gas-Meters.—At the Marylebone Police Court, on Monday last week, during the hearing of a prosecution by the Gas-light and Coke Company of a woman for stealing 9s. and the cash receptacle from a penny-in-the-slot gas-meter, Mr. Paul Taylor remarked upon the extraordinary prevalence of this class of theft. Walter Minnion, a clerk in the service of the Company, stated that during last year 13,300 prepayment gas-meters were broken open and robbed, but only in 198 instances were the offenders convicted. His Worship remarked that this only showed how misleading were the statistics of crime when they were used for the purpose of proving that it was diminishing.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 20.

Sulphate of Ammonia.

The market opened quietly, but towards the close demand improved, there being only another week within which to cover February contracts; and there has been a slight advance in prices. The closing quotations are £11 7s. 6d. per ton f.o.b. Hull, £11 10s. per ton f.o.b. Liverpool, and £11 12s. 6d. per ton f.o.b. Leith. There has been a fair amount of inquiry for delivery over the near months; but makers for the most part remain indifferent about making further sales meantime, the views of buyers being hardly above the level of spot prices. Consequently, forward business has only been on a limited scale.

Nitrate of Soda.

The general situation remains much the same; but more favourable advices from the west coast have stiffened the backs of holders for the time being, and serious spring demand is awaited to sustain this attitude. Spot prices have been advanced to 9s. 9d. per cwt. for 95 per cent., and 10s. for refined quality.

LONDON, *Feb.* 22.

Tar Products.

There has been practically no alteration in the markets for tar products during the past week. Benzol 90 per cent. is still very bad. There are large quantities offering, and business has been done at 6d. per gallon, casks included, f.o.b. London, and in the North at 5½d. Fifty-ninety per cent. benzol seems to be getting weaker, and business is reported to have been done at 6½d. f.o.b. east coast. In toluol, there have been one or two small inquiries, and makers have been a little less independent in their ideas. Solvent naphtha is steady, but no further business is reported. Creosote is still fetching good prices. To-day for the best makes in London 2⅞d. to 3d., and in the Midlands 2⅞d. to 2¾d., are asked; while in the North 2⅝d. to 2¾d. is the price. Crude carbolic is very weak. The market for pitch remains in about the same position. The majority of manufacturers are evidently well sold for the present, and are not disposed to place any further quantity for some little time to come. Some quantity has lately been sold on the Continent for delivery to June, and also for delivery all over the present year, at rather better prices than were obtainable a week or two ago.

The average values during the week were: Tar, 10s. 9d. to 14s. 9d., *ex* works. Pitch, London, 18s. to 18s. 6d.; east coast, 18s. to 18s. 3d.; west coast, 17s. to 18s. f.a.s. Mersey ports, 17s. 3d. to 17s. 9d. f.o.b. other ports. Benzol, 90 per cent., casks included, North, 5½d. to 5¾d.; London, 6d.; 50-90 per cent., casks included, 6¼d. to 6¾d., North and London; Toluol, casks included, North, 8¾d. to 9d.; London, 9¼d. Crude naphtha, in bulk, North, 3¼d. to 3½d.; London, 3½d. to 3⅝d.; solvent naphtha, casks included, North, 10d. to 10¼d.; London, 11d.; heavy naphtha, casks included, North, 10d. to 10¼d.; London, 11d. to 11¼d. Creosote, in bulk, London, 2¾d. to 2⅞d.; North, 2⅝d. to 2¾d. Heavy oils, in bulk, 3d. to 3 1/16d. Carbolic acid, 60 per cent., casks included, east coast, 1s.; west coast, 11½d. Naphthalene, £4 to £7; salts, 35s. 6d. to 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

There have been several inquiries in the market during the past week, and it would almost appear that we shall have a repetition of last month in respect to prices and demand. In London, the principal Gas Companies quote £11 15s. to £11 17s. 6d. for prompt and forward delivery; while outside makers are asking £11 10s. In Hull, to-day's prices may be taken as £11 10s., and in Liverpool at £11 8s. 9d. to £11 10s. In Leith, they are asking £11 12s. 6d. to £11 15s.; but we do not hear of any further business at this figure.

We regret that, owing to a clerical error, the Hull price last week was reported as £11 17s. 6d., and Liverpool £11 18s. 9d. These should have been £11 7s. 6d. and £11 8s. 9d. respectively.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a rather fuller demand for coal in the North-east during the last few days, and also more disposition to buy forward. In the steam coal trade, best Northumbrians are steadier, and up to 10s. per ton f.o.b. is the current quotation for coal for early delivery; while there is a higher price asked for delivery over the shipping season. Second-class steams are from 9s. 3d. to 9s. 6d., and steam smalls are more varied in price—ranging from about 3s. 9d. up to 5s. 3d., according to the quality. In the gas coal trade, prices seem to be rather stiffer, and vary from about 8s. 9d. to 10s. per ton f.o.b. for the usual classes, according to quality; while best "Wear specials" are quoted up to about 10s. 6d. The settlement of a portion of the contracts for London, for a year from the end of June, seems to be giving a little more activity. The amount bought is believed to be about 400,000 tons. The price is stated as likely to leave about 9s. per ton for best Durhams, and 8s. 6d. for seconds; but these figures are based on allowances for freight, and cannot be considered as official figures. Another contract for a comparatively small amount has been settled for a Belgian town—for second-class gas coal—at near 8s. 6d. per ton f.o.b. Coke is quiet, with easier prices. Gas coke is from 10s. 6d. to 11s. 6d. per ton f.o.b.

Scotch Coal Trade.

Trade continues unchanged, which is only to be expected while the difference with the Railway Companies remains unsettled. The tension, however, has not affected prices, which point in the direction (which everyone now expects) of the difference being amicably settled. The quotations are: Ell 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow, splint 10s. to 10s. 3d., steam 9s. 9d. to 10s. Shipments for the week amounted to 255,852 tons—an increase of 16,007 tons upon the previous week, and of 58,920 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,417,156 tons—an increase of 103,386 tons upon the corresponding period.

Public Lighting of Paris.

According to the "Revue des Eclairages," there are in use for the public lighting of Paris 1905 flat-flame and 50,750 incandescent burners, 51 "Lusol" lamps, and 120 lamps burning mineral oil—making a total of 52,826. Of these, 44,507, or about 85 per cent., are of less than 50-candle power. The estimated cost of 1000 candles' light from the gas-lamps is 10 c.; while the same quantity of light furnished by the best arc lamps costs 25 c. Economy, therefore, is on the side of the former. The cost of lighting Paris by gas for the year 1907 was 2,569,315 frs. (£102,773); and by electricity, 1,552,120 frs. (£62,085). These figures, *plus* the cost of repairs, 1,974,659 frs. (£78,986), do not work out to more than 2 frs. per inhabitant. The writer of the article in the above-named publication which furnishes these figures thinks that the lighting of Paris would bear improvement to justify it being called the "City of Light," and that this might be done at an additional cost of 50 c. per inhabitant—a sum which it is thought would be trifling for people who are daily growing more anxious on the subject of the dangers of the streets.

A Fatal Mistake at Walsall.—Speaking at a recent meeting of the Walsall Corporation, Dr. Stead expressed regret that the Electricity Committee had to report the largest deficit since the undertaking was started thirteen years ago. It had been estimated there would be a loss of £600, whereas it was actually £856. During the year 60 tons less of coal was used; but in spite of this the actual cost showed an increase of £361. The revenue had only grown by £69, although £837 more had to be found in respect of capital charges. People had been taking less current, owing partly to trade depression and also to new and more economical lighting methods. A fatal mistake had, he considered, been made in fixing the price for electricity at such a low figure. The wiping-off of the deficit would reduce the reserve fund almost to vanishing-point. In thirteen years the total net profit of the concern had been about £11.

New Joint-Stock Companies.—The Rainford Gas Company, Limited, has been registered with a capital of £8000 in £1 shares, to take over the Rainford (Lancs.) Gas Order, and to manufacture and supply gas in the district. The Lochmaben Gas Company (1908) has been registered in Edinburgh, to take over the business of the Lochmaben Gas Company, Limited. The capital is £1500, in shares of £3 each. The Cardenden Gas Company, referred to a month or so ago in our "Notes from Scotland," was registered in Edinburgh last week. The capital is £20,000, in £1 shares. The object of the Company is to manufacture, purchase, sell, and dispose of gas, electricity, and other suitable agents for providing light, heat, or motive power, in the villages of Auchterderran, Bowhill, and Cardenden, and district, and to dispose of gas, electric and other fittings, gas-meters, gas-stoves, gas-engines, &c. The registered office of the Company is at No. 15, York Place, Edinburgh.

Electricity Loans at Maidstone.—The Maidstone Town Council have received a letter from the Local Government Board intimating that they are prepared to sanction the application of the Corporation for a loan of £20,000 to defray expenditure previously incurred in connection with the electricity undertaking; but they stipulate that the proportions of principal that would have been payable by the Electric Lighting Committee if the loans had been obtained at the proper time, should now be paid out of current revenue. Such proportions of principal, with another item directed to be met out of revenue, amount to £1220; and if they had been included in the balance-sheets of the last two years, together with the proper sums for interest, no profit would have been shown on the undertaking. It is stated in a local paper that the decision of the Local Government Board to sanction the £20,000 loan relieves the Corporation of a serious financial difficulty; their credit at the bank having virtually been stopped since the recent inquiry.

Mr. Russell Oates, Assistant Overseer, of Knaresborough, was found dead in his office on Saturday. The gas-stove was turned on, but was not lit.

At the annual meeting of the Heywood and Middleton Water Board, Alderman Hoyle, of Heywood, was appointed Chairman, and Councillor W. M. Wiggins, of Middleton, Vice-Chairman.

Gas is now employed in 1250 French towns, against 1033 in 1900; and electricity in 2912 towns, compared with 813. The number of towns lighted by acetylene has increased from 8 in 1900 to 130 at the present time.

The Tredegar Urban District Council have adopted some recommendations of their Gas Manager (Mr. W. Davies) for the extension of the gas-works, and have given instructions for the preparation of plans and estimates of the cost.

The Aberavon Town Council have resolved to hand their Gas Manager (Mr. A. J. Bond) £50 in payment for his services in supervising the erection of the new gas-works. One or two of the members opposed the proposal on the ground that the works were not yet paying; but on a division only three voted against it.

It is reported that the Aldershot Urban District Council have arrived at an agreement with the Gas and Water Company whereby the Bill of the latter will not be opposed. Under this, the Company agree not to supply electricity to be consumed in the Council's area. The Farnborough Urban District Council also will not oppose the Bill.

At Rugby, the consideration of a proposal that the Urban District Council convert the street lighting from gas to electricity has been referred to a Special Committee, who will report upon it. When the question first came before the Council, the cost of lighting the 520 lamps by electricity was estimated at £1523 per annum, against £1709 paid to the Gas Company; and the cost of cables, &c., necessary for the conversion, at £5588.

DAVIS—The Gas Stove People.

Programme

I.

Various "Encores" in response to the reception accorded to the "NEW DAVIS" Screwless Cooker during the 1908 Season.

For 1909.

II.

The introduction of important developments in Gas Cookers and patented Domestic Gas Apparatus of various kinds.

The DAVIS GAS STOVE CO., Ltd.,

Diamond Foundry, Luton.

A Local Government Board Inquiry was held last week at Leyland into an application by the Urban District Council to borrow £3564 for an extension of the present water supply system. It is proposed to lay an 8-inch main between the Thirlmere aqueduct at Wheelton and the reservoir at Clayton-le-Woods; arrangements having been entered into with the Manchester Corporation to take not less than 30,000 gallons and not more than 300,000 gallons a day.

At the meeting of the Lambeth Borough Council on Thursday, the Lighting Committee reported that, in accordance with the offer made by the South Metropolitan Gas Company last year, the period for the free lighting of the lamps outside the New Town Hall would expire next month, and that it was necessary for the Council to decide whether or not to adopt this system of lighting. New lanterns and burners of an improved kind had been fixed, and the lamps were ready to be handed over to the Council at the end of the quarter. The Committee recommended the Council to take over the lamps, which would involve an outlay of £105 for their supply and erection, and an annual charge of about £85 for lighting and maintenance. The Council approved of the recommendation.

The Pulsometer Engineering Company, Limited, of Nos. 61 and 63, Queen Victoria Street, E.C., and Reading, announce that they have acquired the business of Messrs. Easton and Anderson, of Westminster (successors to Easton and Co., of Erith), including their goodwill, designs, records, and patterns. They have also secured the services of the heads of the designing and commercial staff, and are thus in a position to carry on the new work in a satisfactory manner without disturbing their existing business. Among the additional work that they will now be able to undertake may be mentioned high-duty pumping-engines for water-works, pumping plant for sewage and drainage work, machinery worked by hydraulic pressure, three-throw pumps, water-wheels and turbines, and apparatus for the drilling and tapping of water and gas mains under pressure.

For some years past, Mr. William Griffin, the Secretary of the Folkestone Gas Company, has, by permission of the Directors, entertained the employees at a smoking concert, and provided them at his own expense with refreshments and tobacco. It took place in the Boardroom of the Company on Saturday, the 13th inst. This year not only did Mr. Griffin entertain the employees themselves, but, acting on the suggestion of Mrs. Griffin, who takes great interest in the welfare of the men and their families, he invited the wives and children to an additional performance on Tuesday last. This kindly forethought was thoroughly appreciated, and about 200 witnessed the capital entertainment provided. On this occasion, Miss Gracie Griffin was presented with a beautiful bouquet by the employees and members of the Sports Club. At the Saturday gathering, Mr. Griffin was supported by his Worship the Mayor (Mr. A. E. Pepper), the Chairman of the Company (Alderman J. Banks), and several Aldermen and members of the Town Council. The programme opened with the farce "Ici on parle Français," in which Miss Griffin scored a decided success as the maid-of-all work. This was followed by a selection of music. During the evening, "The health of the Mayor" was proposed by the Chairman; and his Worship, in response, expressed his genuine pleasure at being present at a gathering of working men, as they knew he had their interests at heart. Brief speeches were also given by Mr. Griffin and Alderman Banks. A successful and enjoyable evening terminated shortly after eleven. The programme and arrangements were in the hands of Mr. A. M. Wilshere.

APPLICATIONS FOR LETTERS PATENT.

2963.—Taylor, G. A., "Gas soldering-bit." Feb. 8.
3003.—Parker, T., "Vertical retorts." Feb. 8.
3036.—Wilton, G. & N., "Saturators for making sulphate of ammonia." Feb. 8.
3050-2.—Rudolph, C., "Flexible pipes." Feb. 8.
3061.—Feld, W., "Extraction of sulphuretted hydrogen and sulphur dioxide from gases, and the obtainment of sulphur from sulphuretted hydrogen and sulphur dioxide." Feb. 8.
3074.—Sprenger, O., "Purification of tar." Feb. 8.
3117.—Jeffreys, J., Herring, E., and Grenville, P. M. B., "Pipe-joints." Feb. 9.
3142.—Harvey, H., "Gas lighting and heating." Feb. 9.
3161.—Ostins, G. F., "Gas-fittings." Feb. 9.
3171.—Lubeck, C., "Catalytic material for the automatic ignition of illuminating gas." Feb. 9.
3190.—Anderson, J., "Automatic lighting and extinguishing apparatus." Feb. 9.
3226.—Williamson, J., "Liquid meter." Feb. 10.
3230.—Hornett, W. C., "Chemical preparation for producing greater radiant heat from coal or coke." Feb. 10.
3268.—Restler, J. W., "Valves and cocks." Feb. 10.
3319.—Jakobson, M., "Safety cocks for gas-burners." Feb. 10.
3326.—Jabs, A., "Gas-furnaces." Feb. 10.
3335.—Brantom, J., "Gas boiling-stoves." Feb. 11.
3477.—Andrews, W., "Stills for distilling ammoniacal and other liquids." Feb. 12.
3572.—Darwin, H., "Inverted burners." Feb. 13.
3580.—Balfour, H., and Co., Ltd., Barker, J., and Hunter, J., "Gasholders." Feb. 13.
3609.—Becken, G. von, "Regenerative furnaces." Feb. 13.

RESTORATION OF LAPSED PATENT.

Notice is given that an order was made on Feb. 9 restoring the letters patent granted to John Frederick Simmance and Jacques Abady for an invention for "Improvements in street-lighting apparatus," No. 19,477, bearing date Sept. 28, 1899.

PAN-CAKES

TUESDAY=
23rd FEBY

AT LEAST
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RICHMOND GAS COOKERS
WILL BE FRYING
Pancakes to-day

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